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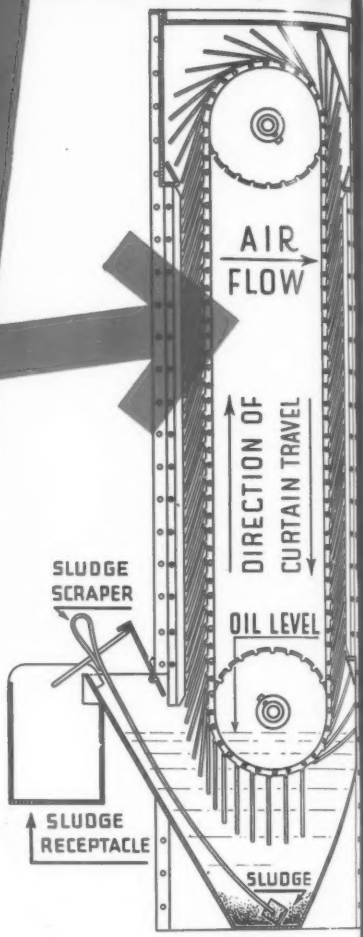

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Castings on Exhibition

For the first time in history—so far as we recollect—there is to be staged in early May in Cincinnati an exhibition solely devoted to castings. There have been similar efforts in the past in this and other countries but invariably they have been associated with foundry-equipment or engineering shows of some kind or another. Obviously, the founders themselves have much of interest to show—especially in museum aspect—but whether business could result is questionable, although from the prestige angle such an exhibition shows distinct potentialities. The range of metals and alloys to be embraced in the exposition is indeed wide, passing as it does through the whole series from steel to magnesium. The processes by which they are made are equally diverse, at one end of the scale, wax patterns and at the other steel dies are used.

The objective of this exhibition is to demonstrate to product-design engineers the advantages of castings over other forms of manufacture. Most of this breed of specialists are tradionalists, and, rightly, play for safety in formulating their structures until they are convinced that a change of material or process will give equally good results and show a saving in production costs. Thus the success of the exhibition will depend upon first securing the attendance of these key men and then on the ability of the exhibitors to convince them, either as to the desirability of changing from existing practice to use more castings or at least to resist in a knowledgeable way the claims put forward for weldings or non-metallics. It should be borne in mind that the requirements of the design engineer may be machinability, heat-, corrosion- or abrasion-resistance, or dimensional accuracy, and a serious attempt is being made to cover these in the exhibits.

As other countries are interested in an exhibition of castings, it is to be hoped that the American Foundrymen's Society, who are organizing the Cincinnati display, will be quite candid as to the results of their pioneer effort. Looking at the matter rationally, there should be many more people interested in castings than in the plant used to make them, but the latter is more purposeful, and can be more easily assembled. A very laudable effort is being made, and we hope—but are not quite convinced—that the success which the project so richly merits will be achieved. Our lack of conviction is based on that pre-stated requirement—attendance of the "product design engineer." He does not represent the purchasing office ! Nowadays, such men are usually interested in a very limited field, which can only be covered by an equally limited number of exhibits. Yet whoever visits the Cincinnati exhibition will certainly receive a good impression of the great contribution the foundry industry has made, is making, and will continue to make to world progress.

F

Investment Casters' Conference

Stratford on Avon Meeting, May 19 to 23.

As already briefly announced in the JOURNAL, this year's conference of the European Investment Casters' Association—a group consisting of some half-a-dozen or more UK investment foundries and about treble that number from the rest of the continent—is to be held in Stratford on Avon from May 19 to 23. The headquarters (and technical sessions) will be at Welcombe Hotel and the majority of the delegates (already over 100 have registered) are to be housed there and at the Shakespeare Hotel.

Programme

General particulars of the programme are as follow:—*May* 19 (*Sunday*): 8.30 to 10.30 p.m. Cocktail party. *Monday:* 9.30 a.m. Technical sessions in the main lounge (with breaks for coffee 10.45 a.m., luncheon 12.30 for 1 p.m., tea 4 p.m.). Dinner at 6.30 p.m. for those requiring it.

A limited number of seats for the evening performance at the Shakespeare Memorial Theatre are available to delegates on this day.

Tuesday: Technical sessions, with general timing as on Monday, but followed at 7 p.m. by the official banquet.

Wednesday: (alternative programmes for both delegates and ladies)

(*a*) Works visits to factories in Birmingham of Joseph Lucas Limited (evening free).

(*b*) Coach tour of the Cotswold country, with luncheon at the Lygon Arms, Broadway, returning at about 6 p.m. (evening free).

Thursday: Delegates disperse.

Ladies' programme (*where different from above*)

Monday: (morning) coach trip to Warwick Castle, luncheon at Guys Cliffe; (afternoon) trip continued to Anne Hathaway's cottage and Shakespeare's birthplace.

Tuesday: Coach trip to Oxford with visits to two colleges, luncheon at Oxford.

List of Papers

So far, the following papers hove been announced:—

(1) "Economics of Vacuum Melting and Casting," by Dr. F. N. Darmara (general manager, metals division, Utica Drop Forge and Tool, Utica, NY).

(2) "Influence of Vacuum on Properties of Various Materials," by A. J. Kiesler and W. F. Moore (metallurgy and ceramics research department, General Electric Company, Schenectady, NY).

(3) "Refractories and Moulding Materials for Vacuum Casting," by H. D. McIntire (assistant chief of metallurgical engineering, Battelle Memorial Institute, Columbus, Ohio).

(4) "Speaking of Investments," by H. J. Meerkamp van Embden (Philips Research Laboratories, Eindhoven, Holland).

(5) "The Scale Effect when Comparing Lost-wax Castings with Castings made by Other Methods," by B. J. Helders (N.V. Industrie Vaassen, Holland).

(6) "Waxes for Investment Casting," by E. H. G. Sargent (Astor Boisselier and Lawrence, Limited).

(7) "A Tour of P.I. Castings," by D. H. Armitage of P.I. Castings (Altrincham), Limited).

(The title of a German contribution is not yet announced.)

General: Non-members (and their ladies) can be admitted to the conference—all enquiries should be

(*Continued at foot of col.* 2)

directed to Mr. G. J. Lee (advertising department), Joseph Lucas, Limited, Great King Street, Birmingham, 19. The conference fee (the amount of which is not yet fixed) will include all expenses in connection with the conference itself for each delegate, but additional expenses will have to be paid separately for accommodation, meals, theatre tickets and coach trips. (It is proposed to report the proceedings at the conference in this JOURNAL in due course.)

Correspondence

DUST CONTROL ON PEDESTAL GRINDING MACHINES

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In his letter to you of March 19, published in your JOURNAL of March 28, Sir George Barnett takes exception to the fact that in an article from this Association in your issue of October 4, 1956, we have stated that the improved system of exhaust ventilation for pedestal grinders developed by the Association was approved by him for universal application.

The following are the facts of the matter: On June 14, 1956, senior inspectors of the Ministry of Labour & National Service carried out tests upon a stand grinding machine fitted with this improved ventilating system. Following these tests a letter was received from Sir George Barnett, the relevant paragraph of which reads as follows—". . . . ,I said that the device as then designed (this refers to the earlier exhaust system developed by the Association) was not acceptable in iron foundries or other factories where substantial quantities of dust are involved in the process of grinding. As seen under test at . . . . . ,there is no longer need for this prohibition: I see no reason why the modified device should not be of universal application."

It will be obvious to your readers that, even if the word "approved," in the view of the Ministry of Labour & National Service, carries a connotation other than that which it is usually given, it is obvious that unrestricted acceptance of the system by the Ministry was clearly stated.—Yours, etc.,

A. H. SULLY,
Director.

British Steel Castings Research Association,
5, East Bank Road,
Sheffield, 2.

April 1, 1957.

Dinner

ALAR LADIES' EVENING

Last week, ALAR, Limited, held their annual Ladies' Evening at the Trocadero, London, with Mr. F. Farendon presiding. The toast of "The Association" was proposed by Mr. Wilfred Brown, president of the Light Metal Founders' Association, and that of "The Ladies" by Mr. E. W. Snowden. The guests included Mr. V. P. Harris, C.B.; Mr. L. J. Chandler; Mr. L. J. Fletcher; Mr. A. P. Fenn; Mr. W. D. Mendham; Mr. Douglas Austin; Mr. H. E. Thatcher; Mr. V. C. Faulkner, and Mr. Beresford. The company was entertained by Jimmy Rogers and his elusive doves and Bobbie Dwyer and June—a dancing act. Music for dancing was provided by Neville Hughes and his band.

Breakdown of CO_2 Cores

*By F. LeServe and H. D. Segrove, M.Sc., F.R.I.C.**

Applications of the CO_2 Process, particularly for core manufacture, are limited by the disadvantage that breakdown of the sand after casting can be difficult. This is especially so in the temperature range 900 to 1,100 deg. C., i.e., the pouring temperature of most of the copper-base alloys. The Authors describe a series of experiments on the effect of calcium-carbonate additions (in the form of ground chalk) on sand/silicate mixtures and illustrate their results by graphs. It is considered that this type of research may extend the field of CO_2 Process moulding and coremaking, especially among bronze- and brass-founders.

When using CO_2/silicate-bonded sands, it is impossible to fix close limits to the range of pouring temperatures in which difficulty is likely to be experienced with core breakdown. Obviously the temperature attained by the core depends not only on the casting temperature but also on the thickness of the metal section and on the dimensions of the core itself. Breakdown will also be affected by the rate at which the core is heated and cooled. However, there is some measure of agreement among research workers that the range in which breakdown is most difficult corresponds at least approximately to the temperature range of 900 to 1,100 deg. C. This is confirmed by laboratory experiments in which the strengths obtained by heating cores at different temperatures were measured†.

It has become common practice to add small amounts of organic matter such as pitch and molasses to the silicate binder to assist in breakdown, but in general this kind of additive burns out at too low a temperature to be effective. The work described in this report has been directed to finding some compound which will not break down too soon after casting. For this reason, and also from considerations of cost, calcium carbonate, in the form of ground chalk was selected. The dissociation-pressure curve for calcium carbonate shows that decomposition begins at about 500 deg. C., but the equilibrium pressure of CO_2 does not reach one atmosphere until the temperature has risen above 900 deg. C. It can reasonably be assumed that decomposition does not proceed with any great speed below 800 deg. C.

Experimental Work

The sand employed for the experimental work was Redhill "F," to this was added 4 per cent. of a proprietary binder, consisting essentially of sodium-silicate syrup with small additions of some organic material. The core-sands were mixed in a Fordath mixer, and, where required, a known volume of calcium carbonate ($CaCO_3$) was added in the form of chalk dust, most of which passed 100 mesh; mixing was carried out for about three minutes. When chalk was added, it was observed that the storage "life" of the core-sand was reduced, and that the sand had to be utilized almost immediately. Experiments showed that the storage life seemed to depend on the fineness of the chalk additive, coarse particles reducing the effective life. If a mix was permitted to stand, even out of contact with air, cores manufactured from the mix tended to be friable.

Standard 2-in. dia. by 2-in. high cores were made, the test-pieces being given three blows of a standard rammer (ten for green-strength). They were gassed for 30 sec. at a pressure of 10 lb. per sq. in. Experiments carried out included: (*a*) ascertainment of green-strengths (these being obtained by means of the standard testing machine and (*b*) compression strengths of the gassed test cores at intervals for periods of up to one week. A Hounsfield tensometer was employed for the latter and this equipment was also used for (*c*), determining the compression strength of fired cores, the results being obtained for differing firing temperatures. All tests were carried out on core sands (with four per cent. binder) containing nil, 1.5, 2.0, and 3.0 per cent. calcium carbonate, in order that the effect of increasing chalk content could be ascertained.

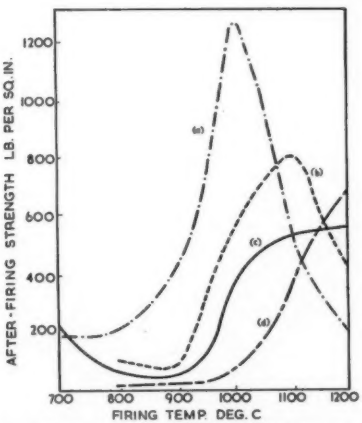


FIG. 1.—*Influence of $CaCO_3$ additions upon the after-firing strength of Redhill "F" sand with differing firing temperatures.*

(*a*) Nil; (*b*) 1.5 per cent.; (*c*) 2.0 per cent., and (*d*) 3.0 per cent. $CaCO_3$.

Ease of breakdown was assessed by measuring the compression strength of standard specimens after firing at various temperatures in a gas-fired

* The Authors are respectively foundry-sand laboratory superintendent and research manager, British Industrial Sands, Limited.

† J. L. Rice. "Survey of the CO_2 Process." Association of Bronze and Brass Founders, miscellaneous publication 471, 1956.

Breakdown of CO_2 Cores

muffle furnace. Specimens were placed in the furnace, the temperature was raised to the predetermined value, and the furnace then allowed to cool, before the specimen was removed. It was found that if the cores were introduced into, or removed from a hot furnace, and thereby suffered considerable thermal shock, spalling took place and the use of spalled or cracked specimens gave rise to very erratic results.

Results

Test-pieces containing between 0 and 3 per cent. of chalk were made up and the compressive strengths of these after firing are shown in Fig. 1. In Figs. 2 and 3, the "gassed" strengths and the

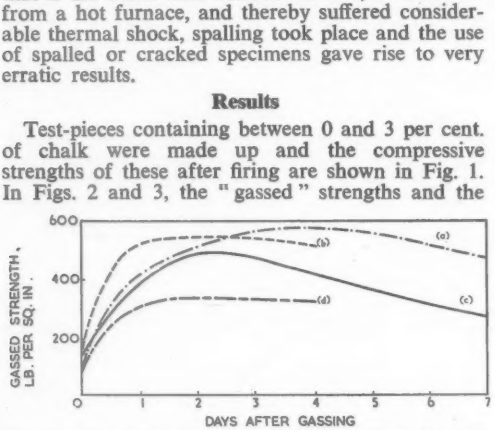


FIG. 2.—*Variation of "gassed-strength" of Redhill "F" CO_2-process sand with $CaCO_3$ additions, on storage over a period of one week after gassing.*

(*a*) Nil; (*b*) 1.5 per cent.; (*c*) 2.0 per cent., and (*d*) 3.0 per cent. $CaCO_3$.

"green" strengths are plotted. In the temperature range 800 to 1,000 deg. C. the strength of the fired test-pieces decreased as the chalk content was increased. At temperatures above 1,100 deg. C. the strengths were higher than when no addition was made.

Fig. 2 shows that the initial gassed strength was considerably higher with 1.5 and 2 per cent. chalk, being 120 lb. as compared with 80 lb. with the binder alone. The 1.5 per cent. addition gave an increased gassed strength up to 48 hours after gassing. With a 3 per cent. addition, the initial strength was similar to that obtained with the binder alone, but thereafter it decreased and the cores became friable after standing for three or four days. After two or three days, all the cores containing chalk had a lower strength than those made without any addition, but with 1.5 and 2 per cent. the decrease was not sufficient to make the cores unusable, even after storage for one week. It appears that 2 per cent. is the maximum tolerable addition, if it is desired to keep the cores for any considerable period between gassing and pouring. Where cores are intended for immediate use, advantage could be taken of the better breakdown obtained with a 3 per cent. addition. Fig. 3 shows that the green strength was improved by the addition of chalk in all cases.

The improved breakdown obtained by adding the chalk seemed to depend on disruption of the bond by evolution of CO_2. When cores were heated for prolonged periods at 1,000 deg. C., the strengths approximated to those obtained with no addition. This seems to indicate that, once the CO_2 had been driven off, fritting took place, with a consequent increase in strength. No explanation can be offered for the initial increase in the gassed strength. However, the decrease in strength on standing may be due to slow liberation of CO_2 from calcium bicarbonate formed during the gassing of the core. It is known that overgassing with a straight silicate binder leads to a loss in strength on standing.

Economics

Ground chalk sells for 5s. per cwt. in Surrey and a similar price might be anticipated over most of the country (powdered limestone would, of course, be a suitable alternative). This price means that a

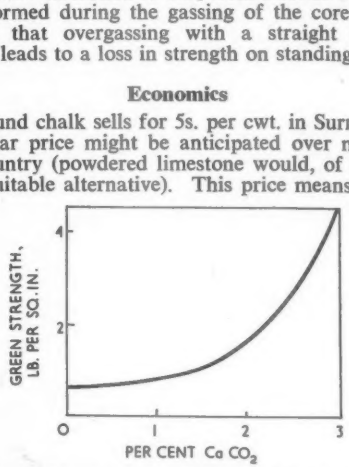


FIG. 3.—*Influence of $CaCO_3$ additions to Redhill "F" sand, on the green-strength of CO_2-sand mixtures.*

2 per cent. addition would increase the price of one ton of CO_2 sand by 2s.

Foundry Applications

The use of chalk as an additive to CO_2 mixes has been exploited in the production of small cylindrical

FIG. 4.—*Gunmetal casting, showing the cores—containing 1.5 per cent. $CaCO_3$—still in position.*

cores for the casting of ordinary gunmetal. These cores were roughly of one-inch diameter and were almost completely surrounded by metal; the pouring temperature was 1,150 deg. C. A typical casting is shown in Fig. 4 and the Authors are indebted for co-operation in this experiment to Surrey Patterns Limited. It was found that the addition of 1.5 per cent. chalk to a 50/50 mix of Redhill "F" and "H" sands with 4 per cent. binder, gave cores which could be removed by tapping the castings with a hammer. Without this addition, the core could only be removed by inserting a metal rod and scraping away the sand. The removal of the sand grains which had been in actual contact with the metal proving very difficult indeed. The production of this particular casting, which was intended for the body of a petrol nozzle, was a severe test of casting technique as it was required to be "pressure-tight"—the incidence of failures after the introduction of chalk to the sand was greatly reduced. A further successful application has been made in the production of a 3-in. dia. core in grey cast iron. Further details are not available.

Conclusion

The addition of up to 3 per cent. of ground chalk to CO_2 mixes improved the breakdown properties of cores heated to temperatures between 800 and 1,000 deg. C. The addition of up to 2 per cent. increased the initial gassed strength, and did not materially reduce the keeping properties of the cores.

Still Larger Ingot Mould

The latest "big" story emanating from the English Steel Corporation, Limited, couples the foundry industry with the steel industry rather in the terms of the popular song: "Anything you can do, I can do better" (but for "better" read "bigger"). This comment follows the announcement by ESC, who already claim to produce the largest steel ingots in the British Commonwealth, that they intend to produce still larger ones—and, of course, the bigger the ingot, the larger the mould that has to be furnished by the foundry industry. A cast-iron mould for the mammoth ingot, specially designed in the ESC drawing office and made by Brightside Foundry & Engineering Company, Limited, was recently delivered to River Don Works of the Corporation. It weighs over 150 tons and is claimed to be the largest one-piece mould made in Great Britain. Of corrugated internal design, it replaces the two-piece mould which is normally used for making large-size ingots. The mould (Fig. 1) is 14-ft. 6-in. long and has an outside diameter of 12-ft. 9-in. at one end narrowing to 12-ft. 5-in. at the other. Before use, the ends are to be faced in a parting machine and the mould fitted with steel tie-bands as a safety precaution. From this mould will be produced an ingot weighing between 285 and 295 tons in the Siemens melting shop of English Steel Forge and Engineering Corporation, Limited. Nearly 20 tons heavier than the previous record-breaker, it will be 26-ft. 5-in. long and 9-ft. 6-in. dia. To cast the ingot, approximately three-quarters of the Siemens department's total capacity of 350 tons of molten steel will be needed, involving the precision tapping of several furnaces.

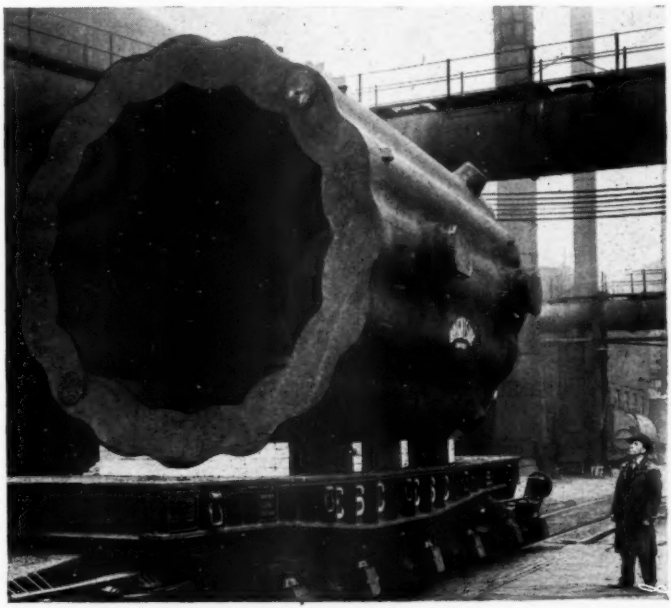


FIG. 1.—*Mammoth one-piece ingot-mould produced by Brightside Foundry & Engineering Company, Limited, being transferred to English Steel Corporation's heavy machine shop for machining before use.*

Vickers' Gift for Technical Education

A hall of residence for more than 70 students is to be built by Vickers, Limited, for the Imperial College of Science and Technology, London, as part of an educational scheme by the Vickers group to train more technologists for industry. The company has promised a grant of £150,000 to build and equip the hall, which will be maintained by the College. It will be named "Weeks Hall" as a tribute to Lord Weeks, until recently chairman of Vickers.

Another feature of the scheme is the establishment of three £400 a year engineering scholarships at Cambridge University, to be known as the "Vickers Scholarships." It is proposed to award the first this year. They will be open to applicants from public and grammar schools, and each holder will normally be required to enter as an undergraduate apprentice in one of the companies of the Vickers group having an established apprentice training scheme.

New Baths for Staveley

Staveley Iron & Chemical Company, Limited, near Chesterfield, have designed and installed new baths for the employees of the cast-iron pipe-spinning plant. Use of the baths is free, the only outlay that the workmen are expected to subscribe, is that for soap and towels, both of these are available at cost price. There are two lockers each for the 680 men, one locker for clean, and one for dirty clothing. After removing travelling clothes, the men place them in the clean locker (there are two drying rooms for use in wet weather) then cross to the " dirty " side through a corridor and change into their working gear. The reverse procedure occurs as work terminates. There are 58 showers in the tiled shower room (Fig. 1), and after the shower the men walk through a trough of disinfectant (to obviate the hazard of athlete's foot) to the clean side of the baths.

The baths were designed in the company's drawing offices and particular emphasis was paid to the colour scheme. Cream tiles and red asphalt floors rescue the baths from the " slaughter-house " black-and-white of many similar buildings. The upper walls are buff coloured and the ceiling pale blue, giving an effect of spaciousness and warmth, and the lighting is good.

On the " dirty " side, the colours, blue and buff, are robust and grime-resisting. Warm, disinfected air circulates continuously through the lockers on both sides of the baths, and thermostats control the indoor temperature at a pleasant level. There are adequate mirrors. One feature of the new baths, is the heating system—steam heat is not used—two oil-fired boilers provide hot water which, in turn, transfers its heat to two large calorifiers, which supply the bath water. This system eliminates the necessity for pressure boiler inspection and periodical boiler-cleaning.

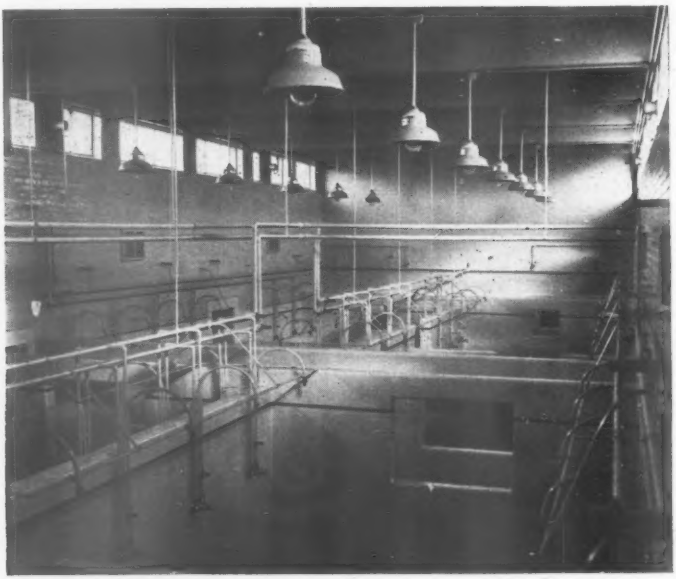


FIG. 1.—*The tiled shower-room of the new baths for the personnel of the cast-iron pipe-spinning plant at the Staveley Iron & Chemical Company, Limited, Chesterfield.*

ESCS Public Issue in the US

The High Authority of the European Coal and Steel Community will make its first public issue, on the United States capital market in April, for a total of $35,000,000. The High Authority's President, Mr. René Mayer, has announced that a registration statement covering the issue was lodged on March 18 with the Security and Exchange Commission in Washington. The loan will comprise two stages: one of $10,000,000 of medium-term bonds repayable in five years, and the other of $25,000,000 repayable in 18 years. The loan issue will be handled by a New York financial group, headed by Kuhn, Loeb & Company, First Boston Corporation, and Lazzard Frères & Company.

The funds to be provided by the loan will be reloaned to firms in the Community member-countries for investment projects conforming to the Community's general objectives and aimed at increasing productivity and production. Loans contracted hitherto by the High Authority totals some $130,000,000. Credits for an equivalent amount have been granted for the financing of industrial investments and workers' houses.

All the loans obtained by the High Authority are governed by the Act of Pledge signed by the Authority and the Bank of International Settlements (BIS) in Basle, which handles the administration of the securities offered by firms.

600-ton Open-hearth Furnace

Claimed to be the largest open-hearth furnace existing, the Weirton Steel Company started up on December 21, a new unit having a rated capacity of 600 tons per heat. This American firm also claims to operate the largest single open-hearth shop in the world. In addition to the 600-ton furnace, the shop contains two furnaces rated at 550 tons, one at 500 tons, five at 450 tons and five at 275 tons. Prior to the recent addition, the rated capacity of Weirton Steel Company was 2,800,000 tons per year. The 600-ton furnace is a rectangular brick and steel structure, the outer wall measuring 26 ft. 9 in. by 108 ft. 6 in., the hearth being 18 ft. 6 in. wide by 75 ft. long. The depth tapers to a maximum of 3 ft. 7½ in. at the centre.

The furnace (No. 14) has seven charging doors compared with five doors in most smaller furnaces and can be fired with oil or tar. Area of checker heating surface is 38,600 sq. ft., heat input being 150 million BTU per hr. Air enters the furnace hearth through two uptakes each of which has dimensions of 8 ft. 6 in. by 11 ft. 6 in. The furnace stack is 250 ft. high, being one of the largest ever built for an open-hearth; its inside diameter is 10 ft. Estimated heat time will be less than 15 hrs. of which about 3½ hrs. will be required for charging.

Hallside Foundry*

Associated with the Steel Works at Hallside, Newton, of the Steel Company of Scotland, Limited, which itself forms one of the Colville Group of Companies.

A foundry department attached to a parent steelworks has the advantage of being able to draw on the economic and accommodation resources of the parent works. Casting production in the case of the Hallside foundry department is of low-carbon steel, normally in the range of 1 cwt. to 10 tons, with facilities for the casting of larger items when called for. This report details practical production techniques of the foundry, its patternshop; moulding; casting and fettling shops, together with a general description of the plant layout. Stages in the production of certain types of marine and engineering castings are illustrated and general views of the foundry and patternshop are included.

Foundry Layout

The foundry section of the steelworks consists essentially of three parallel bays, running north and south, each bay being 350 ft. long, varying in width from 35 to 70 ft. The eastern bay (Fig. 1) is devoted to all heavy or floor moulding, together with casting and mould drying. Box moulding is carried out in the central bay, the western section being utilized for light castings, their fettling, and annealing. Situated at right-angles to these main shops, at the southern end, is the melting bay, with a 4-ft. dia. cupola, together with the sand and mould-preparation departments using oil-sand sections. At the northern end of the main bays is the main fettling shop which is fitted with gas-fired annealing ovens and pits; incorporated with this is the shot-blast room. The list of foundry buildings is completed by a wood patternshop (Fig. 2), and control laboratory.

FIG. 1.—*Moulding shops of the Steel Company of Scotland Hallside works, viewed from the eastern bay, showing some of the pits for the production of heavy castings and examples of cast grids.*

The foundry has specialized, since its inception, in the production of heavy marine castings of skeleton design, for example, stern frames; rudders; propeller brackets, but has supplemented this with general engineering castings of similar tonnage and complexity to accommodate fluctuations in trade demands.

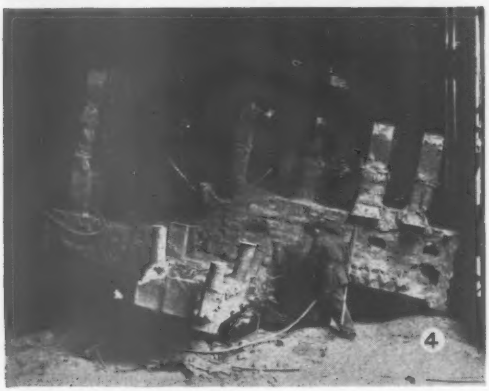
Moulding

Normal production of the heavier castings is of the "one-off" variety, with little or no call for mechanization or machine moulding. Moulding procedures could therefore be classified as the purely artisan or skilled type. The principal moulding media employed is "compo," which is a prepared and "bought-in" mixture of broken brick, fireclay, plumbago, etc., only requiring the addition of water to prepare it ready for moulding, and to

* Abstracted from "A Technical Survey of the Colville Group of Companies" produced by our sister journal *Iron and Coal Trades Review.*

FIG. 2.—*General view of the patternshop showing stages in the production of large jobs; in the foreground is a large pattern for a ship's frame, nearing completion.*

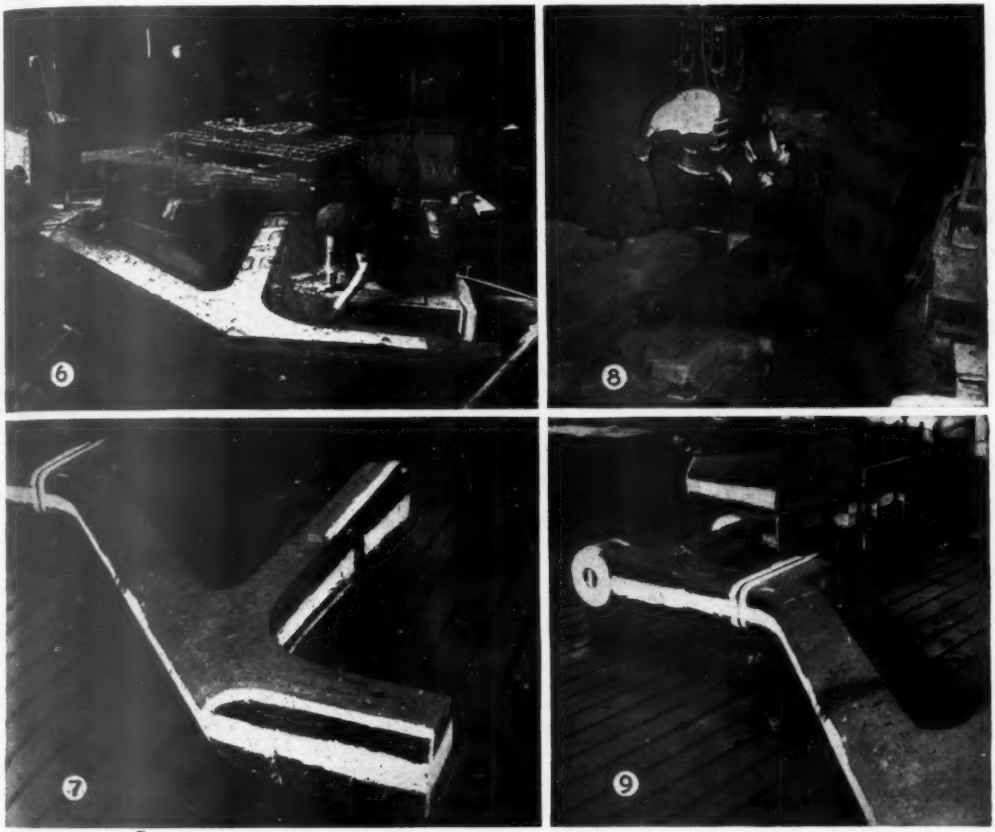
give the requisite green strength. This media is particularly suitable because of its high refractoriness, and high permeability, permitting the escape of the large volume of gases evolved when casting heavy sections. It is employed for sizes down to 5 cwt. (finished weight). Lighter castings are moulded in prepared oil sand, or synthetically bonded sand, and are rammed and dried in the normal manner. For heavy castings, the moulds are prepared in reinforced-concrete pits, being dried out by means of induced-draught portable coke-fired stoves, particular attention being paid to the air circulation and to the venting. Cores and mould tops are prepared and separately dried in the eastern bay, and fitted or closed in the main moulding bay—to permit the handling of the large mould components, the bay is served by gantry cranes of 60 and 80 tons capacity.



Casting

Low-carbon steel is obtained from the adjacent steelworks melting shop, produced in open-hearth furnaces; this steel is transported underground for a distance of 300 to 400 yds., the time taken for this being of the order of 15 to 20 min. from tapping the furnace, to the mould. Molten iron of either hematite or heat-resisting qualities is produced from the cupola, this being of limited quantities, sufficient only for moulding and core-

FIGS. 3 *to* 5.—*Stages in the production of a cast-steel furnace-charger trolley-frame, made in one piece and weighing* 16 *tons;* FIG. 3, *pattern nearing completion;* FIG. 4, *the cooled casting being stripped prior to removal to the fettling shop, and* FIG. 5, *fettled and dressed casting preparatory to machining.*



FIGS. 6 *to* 9.—*Stages in the production of a two-piece cast-steel stern-frame weighing* 13 *tons;* FIG. 6, *moulders setting the lower section of the pattern (in the eastern bay);* FIG. 7, *lower part of the frame—after dressing—set up on the surface table ready for marking-off;* FIG. 8, *final stages in the mould assembly, and core setting for the casting of the upper section of the frame, and* FIG. 9, *upper section of the stern-frame ready for marking-off.*

making sections, with regard to gratings (made in prepared beds in the south bay), core irons and new box parts.

Metal from the 60-ton ladles is transferred into 15-ton ladles, secondary ladles being used for teeming medium and small box-moulded castings. One of the advantages claimed for this method is that faster disposal of the metal is obtained with less temperature drop, giving greater control and increased flexibility. Teeming speeds for the main ladle with a 2-in. nozzle is approximately 4 tons per min.; for large sections, double or quadruple nozzles giving rates of 8 and 16 tons per min. respectively are sometimes employed.

Stripping

Immediately after teeming, the mould weights are removed and the moulds "relieved" in order to allow the casting to contract freely, and to obviate the incidence of hot-tears. Large castings are gradually eased and lifted during the cooling period, which may last up to 168 hr., it is sometimes found that the removal of the feeder heads is advantageous, prior to lifting the casting. The heavy sections are stripped *in situ*, and taken directly to the dressing yard, whilst the small castings are sent to the knock-out. Backing sands are reconditioned, but the facing of "compo" is discarded. Normal foundry techniques are employed for all these operations, and it is not necessary to deal with these in detail.

Fettling

Adhering sand, gratings and core irons are removed by hand and by pneumatic hammers, the castings then pass to the totally enclosed shot-blast room, where they are treated by shot-blasting using air pressures of 70 lb. per sq. in. During this process, heavy dust and grit are removed by an

Hallside Foundry

extraction plant, and the effluents collected; sand for cleaning and recovery; spent shot for re-use, and grit for disposal. The dirt and dust removed passes through a floor grating, the contaminated gas being cleansed and returned to atmosphere.

Feeder-heads, risers, runners and flash is removed (after pre-heating the castings) by means of oxy-acetylene, the gas for this operation being produced in a gas plant situated in the fettling shop. Grain refinement is effected by fully annealing the castings at temperatures of between 900 to 950 deg. C.; this is accomplished in either pit-type furnaces, the largest of which, producer-gas fired, is 27 by 20 by 10 ft., or in separate furnaces.

Final grinding, dressing and inspection are then carried out, and the castings are marked off for checking their dimensional accuracy before despatch. A recent innovation has been the installation of a new loading deck, which has simplified despatch by road transport.

When required, physical tests are carried out on cast-on test-bars, the plant is also equipped with facilities for magnetic crack-detection, X-ray examination, and full laboratory facilities are available.

Safety in Hoisting

An ingenious piece of apparatus incorporating spring balances loaned by Geo. Salter & Company, Limited, of West Bromwich, is in use at the Industrial Safety Training Centre, Birmingham, to demonstrate safety principles while hoisting crane loads. Beneath a 10-cwt. capacity crane-weigher are a pair of 200-lb. capacity circular balances which take the place of the normal rope or chain slings. The angles of the balances, at the point of attachment to the load, can be varied, and the dial readings on the balances demonstrate that the load imposed on the "slings" increases as the angle widens. Thus, with too wide an angle, a sling may be subjected to a loading beyond its safety limit.

Birlec Terminate Agreement

Since 1936, Birlec, Limited, of Birmingham, have been building a range of direct-arc electric melting furnaces for steelworks and foundries. These units are now represented in considerable numbers throughout the United Kingdom and in many overseas countries. Under an agreement with the Pittsburg Lectromelt Furnace Corporation, USA, these furnaces have incorporated in their design the joint experience of the two companies. Recent changes in ownership and policy of the American company, however, have led Birlec, Limited to terminate the agreement as from March 31. Arc furnaces, will continue to be supplied by Birlec, Limited, for the full range of melting and smelting requirements of metallurgical industries throughout the world.

In the illustrations shown, Mr. M. F. Barnes, a director of Inspecting Engineers, Limited, lecturing to students of a slingers' course at the Industrial Safety Training Centre, Birmingham, using apparatus incorporating a Salter crane weigher and two circular balances to demonstrate strains imposed on slings. Comparing the two photographs, in (b) widening excessively the angle of the "sling" has almost doubled the readings on the dials of the circular balances, although the weight of the load, indicated by the crane-weigher dial, remains the same as in the first picture (a). Officials of the Training Centre describe the apparatus as "a most valuable visual aid." (Details of courses for slingers and crane-drivers held at the Training Centre are regularly announced in this JOURNAL.)

Rokide Process

Flame-spraying of Refractory Coatings for Metals

At a meeting of the Southern section of the Institute of Vitreous Enamellers held in London, members heard the first paper to be presented in this country on a novel and somewhat revolutionary process, namely, the Rokide Process. Mr. E. D. Teague, of the Norton Grinding Wheel Company, Limited, Welwyn Garden City, Herts (who have introduced the development to this country), described the process, which consists of flame-spraying refractory ceramic-coatings on metals for ensuring high-temperature service (see Fig. 1). There was no doubt that this matter has considerable possibilities of interest to enamellers and foundrymen alike.

The Process

Requirements for structural materials to withstand ever-increasing temperatures always have been, and will continue to be, a problem for designers in many fields. This was particularly true with the advent of the jet and rocket engines, where stability of the structural materials under high temperatures and often great extremes of thermal shock has a major bearing on the efficiency of the unit. Rocket-propulsion gases may have a temperature exceeding that of white-hot molten steel, and with any metal combustion-chamber and venturi, it is not surprising that severe erosion takes place during firing, often with premature destruction of the unit. For example, a steel rocket venturi, with a throat diameter of approximately 4 in. can increase by ½ in. in dia. in 10 sec. firing, through a combination of melting and erosion by the high-velocity hot gases. Until recently the only answer has been to provide sufficient metal to permit this wear or to attempt artificial cooling, both of which add a considerable amount of unwanted weight to the unit.

The Norton Company of Worcester, Mass., USA, instituted a research programme to investigate possible new materials and processes for high-temperature operation, with particular reference to rockets, and one outstanding result of this programme was the discovery of the method of applying protective coatings of high-melting-point pure oxides, spinels and other materials to metal, graphite, and other surfaces. This has resulted in the development of the " Rokide " coating process.*

General Considerations

Ceramic protective-coatings are not new and a number are available which are very effective at temperatures under 1,000 deg. C. These are usually enamel compositions and applied by spraying the powdered pre-mixed enamel on to a cleaned metal surface, then melting the enamel by placing the coated part in a furnace. The use of such coatings may be limited for three main reasons:—

(1) The enamel must have a melting point lower than that of the surface to which it is applied and thus imposes this same limit on the operating temperature.

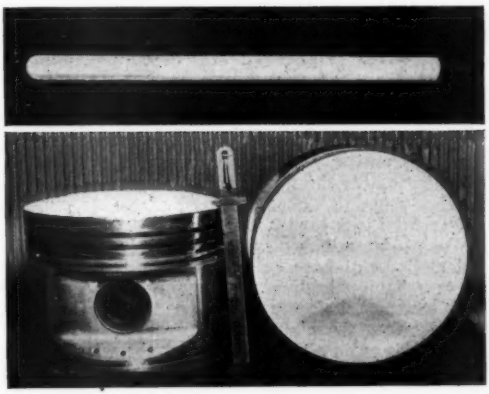
(2) The base material may be detrimentally affected by the enamel firing operation.

(3) There may be limitations as to size or design which could be handled in firing.

Rokide coatings are claimed to have few such limitations. The process is carried out on the cold base material and even an oxide such as zirconia with a melting point of *c.* 2,500 deg. C. can be satisfactorily coated on to the lower-melting-point metals such as aluminium and magnesium. The temperature reached by the article during coating is unlikely to be detrimental and coatings have actually been applied to certain synthetic resin materials without visible charring. The coating thickness can be controlled quite closely and, if necessary, can be varied for particular locations on an article. In addition to metals, other materials which can be coated satisfactorily are solid carbon in various forms, glass, ceramics and asbestos compositions, in fact, no inorganic constructional materials have yet been submitted which could not be coated. The only limitations as to size which can be visualized, lie in the lower limit—it is not practicable at present to coat the inside of tubes or holes less than 3-in. dia. if the length exceeds four times the diameter and, of course, accessibility to a spray gun is a necessary requirement.

Although it is possible to use a wide variety of coating materials, experience has shown that re-

FIG. 1.—*Two applications of the Rokide Process to the treatment of castings. Above is shown a cast-iron pyrometer tube approximately 22-in. long, and, below, are cast aluminium-alloy pistons about 6-in. dia. by 4-in. deep, both items being treated with Rokide " A."*



* This process is the subject of British Patent No. 745,257 (published February 22, 1956).

quirements are likely to be suited by one of three materials which have, therefore, been adopted as standards. These are Rokide "A" (alumina), Rokide "Z" (zirconia) and Rokide "ZS" (zircon), the properties of which are given in Table I. Table II shows the principal properties compared with a stainless steel.

Coating Operation

The coating operation itself is simple and it is claimed that an unskilled operator can be trained in a few days. The coating materials are in rod form and a pistol type oxy-acetylene flame-spray gun, specially designed for the process, is used. The rod is fed at a constant rate through a central hole

TABLE I.—*Properties of Rokide Coatings.*

—	Rokide A	Rokide Z	Rokide ZS
Chemical composition, per cent.	98.6 Al_2O_3	98 Lime stab. ZrO_2	65 ZrO_2 34 SiO_2
Crystal form	Gamma-type	Cubic ZrO_2	Cubic ZrO_2 Silica glass
Bulk density, gm. per c.c...	3.2	5.2	3.8
True density	3.6	5.7	4.15
Total porosity	8 to 12	8 to 12	8 to 12
Thermal exp. per deg. C. between 20 and 1,230 deg. C.	7.7×10^{-6}	11.5×10^{-6}	4.1×10^{-6}
Thermal conductivity B.T.U./hr./sq. ft./in./deg. C. (mean temp. of 815 deg. C.)	34	14	27
Total emissivity	0.3—0.4	0.3—0.4	0.3—0.4
Melting point, deg. C. ..	1,980	2,490	Glassy phase at about 1,650
Colour	White	Tan	Tan

in the burning nozzle, which is surrounded by a cap suitably spaced to pass compressed air. The rod becomes molten in the luminous white cone of the burning gas and small particles are projected off at high velocity by the air blast, striking the surface to be coated while still in a plastic condition. At the same time, the passage of the air over the burning nozzle prevents the equipment from overheating. If it is required to coat long internal diameters, special extension nozzles can be used of the desired length. The rod is fed between two opposing drive rollers which are driven by a constant-speed electric motor through a variable reduction gear. The thickness of coating possible does not appear to be limited and coatings of 2.5-mm. thickness have been applied. The rate of coating varies according to the material used and for a coating 0.010-in. thick may at the present time be from 70 to 150 sq. in. an hour; for example, alumina is near the top figure while zirconia is very much slower. Thicker coatings, of course, require proportionately longer time.

To promote adhesion, which is largely mechanical, a metal base being coated is first prepared by roughening with a shotblasting operation and with correct surface-preparation the coatings are remarkably tenacious. Uniform quality and strength is maintained throughout the whole depth of coating, and, because the process requires that each particle must be molten before it can be transmitted to the coating surface, duplication of the highest possible quality is ensured. It is not possible for the coating to be weakened by the incorporation of unfused or partially-fused material.

Applications

Although the process was primarily developed for thermal protection, the character of the coatings is such that a much wider field of application is provided. For example, the hardness of Rokide "A" (alumina) is comparable with that of the alumina used in grinding wheels and it can therefore be used to provide a wear-resistant surface on metals and other materials. The coatings themselves are unaffected by most chemical agents and stable in combustion atmospheres. The electrical insulation property of the coatings is high through a wide range of temperature. With these properties, either alone or in combination, it is apparent that there is a great potential future for the process in many fields. The measurable properties have been given in Tables I and II, but some of the

TABLE II.—*Comparative Properties of Oxides and Stainless Steel.*

—	Aluminium oxide.	Zircon.	Stabilised zirconium oxide.	Stainless steel.
Thermal expansion per deg. C. between 20 and 1,230 deg. C.	7.7×10^{-6}	4.1×10^{-6}	11.5×10^{-6}	22.0×10^{-6}
Thermal conductivity (B.T.U./hr./sq. ft./in./deg. C.) mean temp. of 815 deg. C.	34	27	14	333
Density, gm. per cc...	3.2	3.8	5	7.8
Melting point, deg. C.	1,980	1,650	2,490	1,430
Hardness (Knoop) ..	2,000	1,000	750	400

general characteristics are discussed further. The nature of the process is such that molten droplets of the coating material freeze on to the surface of the metal and on each other to form an interlocking layer structure of low porosity, and this layering effect apparently increases the flexibility of a normally rigid, brittle material. A thin sheet coated with Rokide can be bent and flexed to a remarkable degree without breaking or cracking the coating. Furthermore, in addition to this mechanical flexibility, the ability of the coating to adjust to stresses also results in a very high resistance to thermal shock. A localized impingement of a flame at about 2,780 deg. C. on a 0.010-in. thick coating for two or three seconds can be sufficient to melt the coating but, on cooling, although the fluidized surface may show fine cooling stress cracks, the adjacent coating and underneath the molten surface is still intact. In a further test, the metal base was removed from a piece of coating 1-mm. thick and 2-cm. sq. This was heated in a furnace to approximately 1,100 deg. C. and immediately dropped into cold water with no apparent detrimental effect.

Although the coatings appear to be the complete answer to many thermal, corrosion, erosion and electrical problems, there are possible limitations associated with their slight porosity. In some cases, with a long enough time, corrosive agents will permeate through the coatings and attack the base material although such attack will be much slower

than for uncoated material. Under thermal cyclic corrosive conditions it is possible that reaction products may form on the base metal underneath the coating and, in time, these can inhibit the movement of the coating with the base and repeated thermal expansion may then cause loosening. This possible effect is mainly associated with convex surfaces such as the outside diameters of tubes and sharp edges and, related to this, it should be kept in mind that, after all, ceramics are brittle materials with compressive strengths about 10 times greater than their tensile strengths and tensile stresses on the coatings, due to thermal expansion, are likely to be more severe on such convex surfaces. This feature is receiving active attention and already very considerable improvements have been effected. The process is still young and refinements to enable the outstanding properties of the coatings to be fully utilized are continually being evaluated.

Interest in the possibilities of ceramic coatings has been principally centred in the aircraft industry, and in the USA, both the Ryan and Solar companies made use of such materials more than a year ago. However, until now in the USA, most aircraft manufacturers have apparently obtained the best high-temperature results from high-barium alkali-free frit materials of the type developed by the US National Bureau of Standards.

In work with full-scale engine components, 0.030-in. thick coatings were utilized on ramjet aircraft combustion chambers or tailpipes and on V-type gutters of ramjet flameholders; and several parts were finished only in areas where heating conditions were most severe in order to determine the protection that was being obtained by subsequently comparing coated and uncoated surfaces.

Results

Results then noted after operational tests were most favourable, although coatings on gutter components failed to perform as well as those on combustion chambers. Severe engine vibrations failed to loosen the ceramic-metal bonds in the combustion chambers, and the only flaws observed after repeated operations were the result of local hot-spot buckles which might have been avoided if the parts had been properly processed.

Mechanical tests made with the subject coatings revealed remarkable resistance to impact, and in many cases neither ceramic nor metal materials were damaged by repeated blows made with the ball end of a ball-peen hammer.

Metallographic investigations indicated that the metal/ceramic bonds produced in applying the coatings were primarily mechanical, since there were virtually no signs of intermetallics or inward coating diffusion. Rolling tests made with coated tailpipe sections on a set of 8-in. rolls, showed that the ceramic finishes could be cold rolled to a 7-in. radius (starting from a radius of 14 in.) without cracking and spalling.

Rokide coatings are now being tested for their suitability in a wide range of applications in the UK as well as America. Consideration of their remarkable thermal, electrical and wear-resisting properties as indicated in Tables I and II, together with the fact that they are capable of being ground to precision tolerances, would indicate that they have a promising future. The Norton Grinding Wheel Company are prepared to grant user licences under the patent and supply the spray unit and coating rods. Metallisation, Limited, of Dudley, Worcs, manufacture the special spray units necessary and are collaborating in the further developments of the process in this country.

Law Cases

Silicosis—Decision Reversed

A West Bromwich man who contracted silicosis and was awarded £9,645 damages against his employers by Mr. Justice Devlin at Birmingham Assizes in March, 1955, had the decision reversed at a retrial by Mr. Justice Pearson in the High Court. Entering judgment with costs for the defendants, Highway Ironfounders (West Bromwich), Limited, his lordship said the misfortune of the case fell on plaintiff, Mr. Walter Richards, and he was not entitled to damages.

The defendants had appealed against Mr. Justice Devlin's decision and the Court of Appeal ordered a retrial on the question whether the defendants failed to comply with their statutory obligations in not supplying dust-protective masks. Mr. Justice Pearson held that the use of the particular type of mask necessary in the circumstances would not have been a practical measure. There had been no negligence or breach of statutory duty. Mr. Richards, who is 46 and married, with two children, was said to be totally incapacitated with silicosis. He worked as a moulder at defendants' jobbing foundry from 1929 to 1952.

Path Obstruction Blamed

A labourer whose left thumb was injured while working for Newton Chambers & Company, Limited, of Sheffield, at the Temple Gas Works, Anniesland, Glasgow, in December, 1953, claimed damages at Sheffield Assizes on March 15. He was Michael Murphy, of Glasgow, and it was stated that he and another man were carrying a heavy valve along a path between building material and equipment when the path was obstructed by the leg of a partly dismantled crane. While the men were trying to lift the valve over the leg, it slipped, and the plaintiff's thumb was trapped. The end of the thumb was crushed and had to be amputated. Severe pain was caused and four operations were necessary. Mr. Justice Oliver awarded £300 damages, and £197 17s. 9d. agreed special damages, and costs.

AFTER ADMITTING A TECHNICAL BREACH of the Factories Act at Ilkeston Magistrates' Court, Derbyshire, the Stanton Ironworks Company, Limited, Nr. Nottingham, were fined £50. It was alleged by Mr. R. L. Lind, district factories inspector, that this breach of the Act caused the death of Mr. Roy Whycliffe Drury who was employed as a fitter at the New Works Foundry. He said that the man went into the foundry to work with a lamp, and when he inserted the plug of the lamp in the wall socket he was electrocuted. There may have been a wire loose inside the plug which touched the casing, however, if the switch box had been earthed, the accident would have been avoided. For the company, Mr. G. W. Hodgson, said that the plug had been incorrectly assembled only a few weeks before the accident but it was not known who was responsible for this. Every conceivable safety precaution was taken to avoid accidents in the factory.

DSIR Research Reports

The Department of Scientific and Industrial Research has issued a further list of Research Reports which are available for inspection at the Technical Information and Documents Unit, Cunard Building, 15, Regent Street, London, S.W.1. The Reports may also be borrowed without charge, or copies or photocopies for retention may be obtained on request from the above address at the prices indicated; payment should not be made at the time of ordering. Brief synopses of four of the Reports which foundrymen would find to be particularly useful are recorded in what follows:—

P.B. 121033 *Notch Ductility of Malleable Irons*: The inadequacy of the simple tensile test as an indication of the ductility of a metal is discussed and proposals are made for a "cleavage crack" ductility test. The cleavage crack which serves as a notch, is developed in the test material by the use of a brittle weld of a type normally used for hard-surfacing. The drop-weight method was used to establish nil-ductility transition temperatures and an explosion crack-starter to determine resistance to fracture propagation at temperatures above the NDT temperature. Results are correlated with Charpy V-notch tests. The Report then discusses the variables of alloy compositions and section size effects. A comparison is then made between ferritized nodular and malleable irons and tests described of commercial malleable irons. The notch ductility of ferritic irons is impaired by the presence of phosphorus, carbides, and primary graphite. The NDT temperatures of pearlitic irons are higher than those of ferritic irons and are affected by hardness, method of heat-treatment and phosphorus content. Explosion tests indicate that the complete change from nil-ductility to complete resistance to brittle fracture occurs over the temperature range indicated by the Charpy transition curve. (A microfilm of this Report costs 5s. 6d. and an enlarged print 27s. 6d.).

P.B. 121014 *Notch Ductility of Austenitic Nodular Irons*: A study of the notch ductility characteristics of two types of austenitic-nodular irons, based on the drop-weight test are described. It is shown that irons containing less than 0.6 per cent. chromium have extremely low nil-ductility temperatures and are recommended for low-temperature applications under severe service conditions. Irons containing 1.6 to 2.25 per cent. chromium were found to have erratic notch ductility characteristics with NDT temperatures varying from −60.0 to above 91.0 deg. C. The notch ductility characteristics of these irons are impaired by increasing section size, phosphorus content and the presence of carbide structures. (The cost of this report is 5s. 6d. as a microfilm and 27s. 6d. as an enlarged print).

PB. 121226 *Investigation of Modified* 12 *per cent. Chromium Steels for Intermediate Temperature Applications*: Details are given of a study of the creep-rupture properties of 12 per cent. Cr steels modified by additions of molybdenum, vanadium, columbium, titanium and carbon. Tests were made at 590 and 650 deg. C. for materials as cast; cast and homogenized; forged and normalized; and forged, normalized and tempered. Room-temperature tensile properties of these alloys were also determined. Results indicate that rupture life is increased by raising the austenizing temperatures and by faster cooling rates. The high-temperature strength of a basic composition (Cr 11.5, C 0.16, Mo 0.5, and V 0.7 per cent.) was improved by an increase in molybdenum content and lowered by increase of carbon, vanadium and titanium. Columbium did not give a consistent effect. One alloy containing 1.0 per cent. molybdenum, and 0.7 per cent. vanadium possesses creep-rupture properties which compare favourably with those of the best columbium-free alloys so far developed. (Price 6s. 3d. as a microfilm and 31s. 3d. as an enlarged print).

PB. 111699 *Development of Sand-cast, Aluminium base Alloys Having Improved Properties*: Part I deals with the development of a new Al/Mg/Zn casting alloy (nominally 7 per cent. Mg-3 per cent. Zn) with low as-cast brittleness. Given proper heat-treatment, elongation can reach 8 per cent., yield strength 35,000 lb. per sq. in. and ultimate tensile strength 48,000 lb. per sq. in. In Part II age-hardening of Al-9.5 per cent. Mg alloys produced only an insignificant decrease in ductility (from 21 to 19 per cent.). De-gassing with chlorine was considered necessary, and also minimum additions of Ti and B for grain refinement. (Cost 18s 3d. as a microfilm).

British Oxygen replies to Monopolies Commission

In response to the Monopolies Commission report published in January, the British Oxygen Company, Limited, has issued a booklet which was sent out to 250,000 members of the public, shareholders, customers, and employees, before the annual meeting on March 27. The booklet states that a number of the commission's recommendations are being applied by the company at once and talks are continuing with the Board of Trade.

Commenting on the issue, Mr. J. S. Hutchinson, chairman of the company, states: "The duties of the commission involve examination and criticism. These are welcomed by British Oxygen; but the completeness of the case involves some considered response. A further statement will be made when our talks with the Board of Trade have been concluded."

Referring to the recommendation that new scales of prices related to costs in each class should be drawn up and applied uniformly to all customers, the booklet states: "BOC will enlist the best independent professional assistance in a new examination of costs to ensure that this recommendation is given the fullest advertence."

Profits and research are described as debatable issues. "The fact that the commission is divided on the question of profits shows at once how hard it is to agree profit rates," it is stated. Profit should be related to replacement cost and on this basis actual profits were 16 per cent. in 1955 and 15 per cent. in 1956.

Principles agreed include:—That the company should refrain from making use of "fighting" companies. (This has already been applied in practice); that a consumer ought not to be restricted in his gas purchases by terms attaching to apparatus. (This will affect 1½ per cent. of the company's customers).

On the recommendation that the company should not try to control the provision of plant to other suppliers, or to consumers who might wish to make their own gas, the report states: "The plant building resources of BOC are at the disposal of all who wish to purchase a private plant."

Stressing that the company has submitted competitive quotations for sale of plants to customers, the report adds: "No difficulty is placed by BOC in the way of any customer who wishes to purchase a plant from BOC or from any competitor."

Autosonics

This JOURNAL, on December 13, 1956, on page 709, carried a description of the results obtained at Goulds Foundries, Limited, Monmouthshire, from the use of a MK 5 supersonic flaw-detector supplied by Kelvin & Hughes (Industrial), Limited, 2, Caxton Street, London, S.W.1. It was then reported that the service it was giving was cutting costs, increasing production, and enhancing quality. Since that time, there are rumours that tensile strength can now be approximated from the constant use of the apparatus. The manufacturers of this equipment have mechanized the plant under the name "Autosonics," which embodies a series of sensitive and stable electronic circuits. These maintain constant vigilance and operate automatic alarms when defects are found. The system ensures that high-speed ultrasonic inspection can be maintained and thus provides the means for inspecting large volumes of production.

Electronic Circuits

The apparatus is based on a system of electronic circuits divided into the flaw-detection section; automatic gain-control section; automatic flaw alarm and recorder section, and system-fault alarm section. After being set up, these sections replace the operator by performing his functions with rapidity and accuracy.

Initial adjustments are rendered easy by a novel method of display on the cathode-ray tube screen, for example, in a single-channel equipment there are two sections of the traces which are brighter than the rest. These bright portions define the position of the electronic "gates" essential to the operation of the automatic circuits. The purpose of these "gates" is twofold. First, they select defect indications from all or only selected strata in the cross-section of the material. Secondly, they select only those defect indications which are greater than a pre-set amplitude.

Flaw-detection Circuit

The flaw-detection circuit generates ultrasonic waves which are transmitted into the material—as a sequence of energy impulses—by an inspection probe coupled to the surface of the material by a liquid (Fig. 1). It also amplifies the reflected pulses and presents the complete sequence of events as a trace on the cathode-ray tube screen.

Automatic Gain-control Section

The automatic gain-control section maintains the sensitivity of inspection by monitoring the amplitude of a selected echo pulse, and wherever necessary, alters the gain of the amplifier to compensate for any change in the pulse.

Automatic Flaw-alarm and Recorder Section

This section operates warning lights, bells or klaxons, when a flaw indication is obtained on the cathode-ray tube screen. It can be adjusted to respond to indications from defect signals in any section, or to definite predetermined locations. Sensitivity can be adjusted so that it will respond to large or small indications ignoring those which are less than the present level. The output from this section can be used to operate various recording systems.

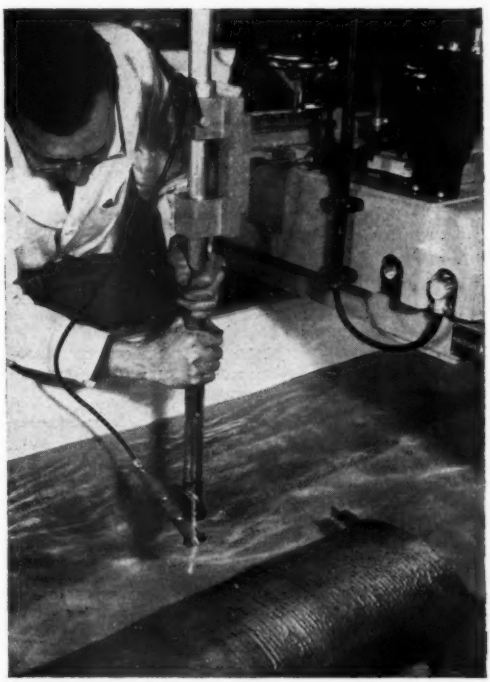
System Fault-alarm Section

In the event of the selected monitor signal falling below its control level for any reason, an alarm will operate which will stop the scanning machinery. The alarm will operate until the fault is corrected and only then can it be reset.

Mechanical Details

Two systems were displayed to the Press recently, at the firm's Barkingside research establishment, both incorporated in the same plan. For the scanning of a plate, the movement of the probe, supplied by a continuous supply of water, resembles that of a very rapidly moving planing machine so that the entire surface was scanned (Fig. 2). The second, actually a 12-in. dia. aluminium billet made for extrusion purposes, was rotating in a water tank (Fig. 1). The probe was lowered into

FIG. 1.—*Setting up the Autosonic probe unit for inspection of light-alloy billets using the immersion technique on the demonstration equipment installed in the Kelvin Hughes research laboratory at Barkingside, Essex.*



Autosonics

the water—its end being about 2-in. from the billet —and traversed over the length of the billet. As each traverse was made, a thin line was produced on a graph whenever a defect was encountered. Thus, the graph gave both the location and intensity of the fault. Naturally, the more complicated the component under test, the more difficult becomes

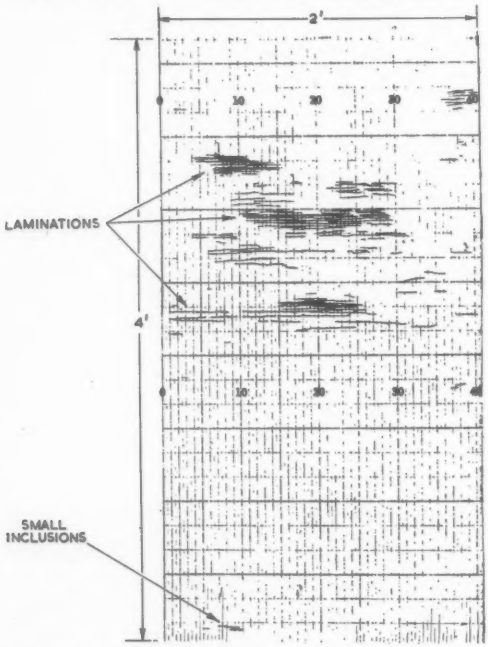


FIG. 2.—*Reproduction of a plan position indication recording taken from a steel plate* 4 *ft. by* 2 *ft. by* 1 *in. showing the position of areas of laminations and small inclusions.*

the tooling up, but where mass production of castings (or indeed other metallic components) is in operation, then the security of quality in deliveries makes any given set of conditions a matter worth careful consideration to see if such a system of fault location can be incorporated.

THE ANNUAL CARPET BOWLS MATCH for the Ure Memorial Trophy for which teams from the Carron Company; the Falkirk Iron Company, Limited; Callendar Abbots and Smith & Wellstood, Limited, compete, was won by the last named company.

WHEN THE DIRECTORS of the National Steel Foundry (1914) Limited, Leven, gave a dinner in the works canteen for long-service employees, the years of service represented topped the 2,500 mark. Each of the 88 employees, all with the firm for more than 25 years, received a silver badge. Eight had over 40 years' service.

Buying Steel Castings

If the customers of the foundry industry would slavishly follow the tenets enunciated in an article, carrying the title "Buying Steel Castings" printed in a bulletin issued by the British Steelfounders' Association, the whole business of manufacturing castings would be placed on a much sounder basis. From this article the following extract has been made:—

Bearing in mind that generally speaking steel castings are parts which are required to withstand higher than average stressing, and are therefore vital components of the structures in which they are used, a purchasing officer must be concerned first to ensure that he has in his possession all the relevant information that he requires to pass on to the steel founder.

First, the detailed drawing; this should provide the following information:—

(1) Name and number of part; (2) Actual or estimated weight—if available; (3) important dimensions; (4) dimensional tolerances; (5) exact location of machined surfaces, and (6) special requirements such as surface finish, testing, gauging, jigging points, etc.

When the buyer has satisfied himself that the drawings contain the necessary information and that the specification is quite clear, he will then turn his attention to the commercial considerations with which he is mainly concerned. In other words, if a quotation has not been obtained already, he will now set about getting one.

In order to enable the steel founder to quote a definite price, the buyer should tell him how deliveries will be scheduled and the total number of castings that will be ordered. This is important, since a steel founder can often quote lower prices for unusually large quantities of castings off the same pattern. At the same time the buyer should make it quite clear what is to be the arrangement with regard to the provision of the pattern equipment and coreboxes.

Other Considerations

In general, it is better to leave the manufacture of new pattern equipment and coreboxes to the steel founder. When they are, however, already in existence, they should be carefully described. The description should cover:—

(1) Type of pattern; (2) condition, and (3) material from which it (or they) are constructed.

If a new pattern has to be made, it is particularly important that the steel founder should be informed whether it is required to be of a permanent type of construction or otherwise. Finally, the buyer should specify any other special conditions to which the steel founder will be required to conform, and the procedure which is to be followed in making delivery. He should also specify any markings which are required on the casting.

The majority of steel castings, whether required singly or in larger numbers, are produced without prototype work being undertaken. It is all the more important, therefore that nothing be left to chance in negotiating their supply. Apart from considerations of quality, care in placing enquiries, and subsequently in ordering, can exert most advantageous influences on the final cost of a *finished component*—not by any means the same thing as the basic cost of a steel casting in the as-cast condition. It is essential to regard the steel-casting industry as providing a manufacturing process of immense flexibility. The industry is not supplying a standard form of product. It is in the interests of every user of steel castings to recognize these facts and to approach the act of placing orders with appropriate concern to get the best out of the process.

Notes from the Branches

West Wales Section

There was a good attendance at the meeting of the West Wales Section of the Institute of British Foundrymen, held at Llanelly on February 22, to hear a paper presented by Dr. B. H. C. Waters who stepped in at very short notice when Mr. J. C. Bailes—the speaker scheduled—was unable to be present. The paper, illustrated with a film and lantern slides, gave some of the author's experiences in making steel castings with the CO_2 and shell-moulding processes. A comparison was made between the two methods, also between CO_2 and conventional moulding, and examples were given of advantages gained and snags encountered with the newer processes.

One contributor to the discussion which followed considered the comparison between CO_2 and shell-moulding unfair in view of the high pattern-costs for the latter. He also stated that in the foundry to which he was attached, paint was not used for coating CO_2 moulds and that fewer hot-tears were encountered when using this process. Another speaker said he had found that 5 per cent. sodium silicate used with molasses gave the most satisfactory results. There was further discussion on the merits of the CO_2 Process and two lines of thought emerged: (*a*) It was suggested that to get the full benefit, the foundry layout should be made to suit the CO_2 Process instead of using the method in a foundry arranged for conventional moulding; (*b*) by suitable minor modifications, the CO_2 Process could readily be used in a foundry which was arranged basically for conventional moulding. A vote of thanks was proposed by Mr. Selson and seconded by Mr. Warner. Dr. Waters, in reply, said he was most pleased that his paper had evoked so much discussion. Before closing the meeting, the president, Mr. R. S. Turner, again thanked Dr. Waters for his very interesting lecture, given at such short notice.

Birmingham

At the February meeting of the Birmingham branch of the Institute held at the James Watt Memorial Institute, a paper entitled "Sub-surface Blowholes in Grey Cast Iron and their Association with Manganese-sulphide Segregation" was presented by Mr. W. G. Tonks, a member of the branch.

Mr. Tonks commenced by saying the sub-surface defects which were not revealed until a machining operation or finishing process had been carried out were probably the most troublesome and costly as far as the foundryman was concerned. Together with wasted process-time foundry production could proceed for a long period before the defect was brought to light. Illustrations were shown of the defects in castings taken from several different foundries covering a wide range of metal composition. Microscopical examination showed that in each case there were two common features; the presence of a slag-like material at the bottom of the holes and a marked segregation of manganese sulphide within the defective areas.

Mr. Tonks went on to describe a series of test castings which had been made to study the effect of manganese content and pouring temperatures on the defect. It was shown that as the manganese content was raised and/or the pouring temperature decreased there was a greater tendency to produce the defect. The product of the manganese content and the sulphur content of the metal at a given pouring temperature has a critical

(*Continued at foot of col. 2*)

value which when exceeded promotes the occurrence of sub-surface holes. The incidence of sub-surface holes was increased as the pouring temperature fell, and low pouring temperature was the primary cause of the defect in the test castings. The Author acknowledged his thanks to the director and Council of the British Cast Iron Research Association for permission to publish the paper.

News from South Africa

Port Elizabeth to be Main Manganese Port?

The Minister of Transport, Mr. B. J. Schoeman, has announced in Port Elizabeth that the South African Railways Administration is studying the feasibility of making Port Elizabeth the Union's principal port for the shipment of manganese ore. The city would need a new harbour berth, additional rail facilities and loading apparatus if the decision were made concerning manganese-ore shipments: the decision depended upon the "economic feasibility" of the plan, he said. Even if the decision were made it would probably be two to three years before the new projects could be undertaken, because the present commitments for harbour expansion would take that long, Since early last year, about 148,500 tons of ore had been exported from Port Elizabeth.

New Company is Making Cement from Slag

Building Binders Limited, P.O. Box 3222, Johannesburg, who recently established a new, modern factory at Vanderbijl Park, to manufacture cement from slag from the Iscor plant, are now in full production.

The new industrial venture, with a capital investment of nearly £300,000, uses as its basic product Iscor slag, a product which up to the present and before the opening of the new cement factory, was a waste product. Building Binders Limited, will use approximately 90,000 tons of the slag a year and will produce approximately 100,000 tons of cement annually. Apart from supplying the needs of the South African market, the firm will also develop an export trade to other African territories.

Riscom

The Rhodesian Iron & Steel Company (Pty), Limited, is taking over the Rhodesian Iron and Steel Commission (Riscom). The capital of the new company is nominal (£4,000 in shares of £1 each), the plan being to expand the Colony's iron and steel industry at an estimated cost of £8,000,000. The development is planned to coincide with the production of power from Kariba and the consequent easing of coal transport problems. The private company will probably be converted into a public liability company and the production aimed at is 250,000 tons of finished steel annually.

Shareholders of the new company are: Lancashire Steel Corporation, Limited, Stewarts and Lloyds, Limited, Messina (Transvaal) Development Company, Anglo American Corporation of S.A., the British South Africa Company, Rhodesian Selection Trust and the Southern Rhodesian Government.

It's an ill wind . . .

It's an ill wind that blows nobody any good, and this is exemplified by what has happened as one of the results of the Suez affair. For one thing, South African engineering enterprises have been doing increased business because of the closing of the canal, a closing which has brought about the diversion of many ships around the Cape. Union ship repairers and firms of painting contractors in South Africa have also participated in the boom.

Equipment & Supplies

Performance Recorder

Comprehensive equipment permitting a record to be taken of the time-factors involved in machine-production operations on punched-tape or cards has been developed at the Battersea laboratories of the British Iron and Steel Research Association, and will shortly be available for purchase. It will be marketed by Digital Equipment Company, Limited, (136, Battersea Park Road, London, S.W.11), and Davy & United Engineering Company, Limited, (Park Iron Works, Sheffield), under the name of "Crowd" (control-recording of works data). This equipment could be of interest to large foundry organizations, producing either multiple, bulk, or one-off orders that are costed on a time and material basis. By virtue of the design of the electronic-system incorporated in Crowd, the operator is able to record the following data: (*a*) Shift number (1, 2, or 3) (*b*) control-panel number (01 to 18) (*c*) order number (0 to 9999) (*d*) breakdown code-number (0 to 12), this enables the operator to record the time that a machine is idle due to a fault, and the type of fault; and (*e*) the time spent on the operation, or "machine time."

At present the instrument can be supplied with any number of control panels up to 18, these can be installed close to machines or at key points in the works, while the "storage cubical" and tape and card punch-machines can be situated in the works offices. The equipment is claimed to be reliable, accurate, easily maintained, and to permit the costing analysis of an order to be considerably simplified. A logical extension of the system would be the transmission of data from a group of outlying factories to a master computor at the head office, perhaps situated miles away. The cost of the equipment is said to be in the region of £7,000; further details are available from Mr. G. Hunt, Information Officer, BISRA, 11, Park Lane, London, W.1.

Tool- and Die-handling Machine

Matling, Limited, of 28, Caxton Street, London, S.W.1, announce the production of a tool- and die-handler, which is a pedestrian-controlled battery or mains electrically-powered lift-truck incorporating the "Talbot-Ponsonby pull-on/push-off attachment." This feature permits one operator to manipulate dies and tools from a storage rack or from the moulding or die-casting machine on to the platform of the handler, or *vice versa* (Fig. 1). The platform, 32 by 34 in. wide, has a capacity of up to three tons, with a height of lift of 53 in. The complete machine is 64 (battery model), 57 (mains model) in. long and the height and width of both models is 34 and 68 in. respectively. It is claimed that the handling and transportation of heavy and awkwardly-shaped dies and tools is greatly simplified when the machine is used.

FIG. 1.—*Tool- and die-handling machine manufactured by Matling, Limited, being demonstrated with a 4,000-lb. load.*

Fire-hose Reel

A new fire-fighting hose-reel unit has been introduced by the Pyrene Company, Limited, Brentford, Middlesex, claimed to be particularly suitable for outbreaks involving combustible materials such as wood, shavings, etc., where a cooling or wetting action is required. The new design eliminates difficulties normally experienced by untrained persons when handling canvas fire hose. It embodies a device which enables unkinkable hose to be run out in any direction without the obstruction of swinging joints. To effect this, the reel, complete with hose, is mounted on a bearing which is fixed to a wall bracket; the water supply passes through the back centre of the reel and through the hose which terminates in a shut-off nozzle cock.

To use the reel, the operator simply opens the water valve whilst taking the nozzle from its bracket, draws off from the reel enough hose to enable him to get within effective striking distance of the fire, and then opens the nozzle. Immediately the fire has been extinguished, the water can be turned off at the nozzle to prevent unnecessary damage by water. The unit can be accommodated in a recess 4 ft. by 3 ft. by 1 ft. and supplied in standard fire-red finish or ready-primed for an alternative finish.

TAYLOR WOODROW (BUILDING EXPORTS), LIMITED, of Welbeck Street, London, W., have instituted in the UK the first large-scale example of the "comprehensive-service" type of factory-building contract. This contract covers the finding of suitable sites and in addition to construction, carries the job right through to the moment when the building is ready for occupation. The service can also cover the appointment of architects, negotiations with local authorities, land purchase, legal arrangements, and, if necessary, finance.

IN THEIR HOUSE ORGAN the *Hilger Journal*, Hilger & Watts, Limited, of 98, St. Pancras Way, London, N.W.1, announce that they have just produced a fluorite polychromator whereby, for the first time, one of the most intractable of spectrographic problems can be solved automatically, with absolute certainty and high precision, in less than two minutes. The problem is that of determining carbon, phosphorus, and sulphur in steels, and its solution requires the exploitation of the resonance lines of the elements in the far ultra-violet or Schumann region of the spectrum. Details are available by writing to St. Pancras Way asking for publication CH 400.

Book Reviews

Handbook for Welding Design, Vol. 1; edited by C. Rowland Harman, B.Sc. Published by Sir Isaac Pitman & Sons Limited, for the Institute of Welding, 2, Buckingham Palace Gardens, London, S.W.1; price 45s. net.

Welding, which started many years ago as a method of repair has long since taken its place as one of our major methods of engineering construction. After a long period of hesitation and suspicion, the most complicated designs up to very large products indeed are now produced entirely by methods of fabrication. The subject is an extremely intricate one and new developments and discoveries are being made every day in connection with it. A tremendous amount of technical literature has appeared and continues to appear every week in a number of publications devoted specifically to the subject. In factories where fabrication has been adopted as a basic method of construction for the products of that factory, designers and draughtsmen are no doubt thoroughly familiar with the principles and techniques involved, but in a large number of general engineering works the design of fabricated structure too often is still arrived at by putting a number of plates and sections together in a shape that approximates to that required, taking a run or two of weld along the seams, and hoping for the best. This book has been prepared by the Institute of Welding to remove the last lingering excuses for the retention of any such practice.

This first volume deals entirely with the fabrication of mild- or low-alloy steels by metal-arc welding. The first short chapter is devoted to a consideration of the general principles of processes, and while it cannot be said that anything essential has been omitted the treatment is perhaps a little cursory. Compensation is, however, given by the excellent practice of adding at the end of the chapter (and of all other chapters) a list of references to publications in which the particular question dealt with can be further pursued.

A chapter follows on the choice of materials which is again necessarily of a somewhat general nature, but which contains most information short of the requirements of a professional metallurgist. Electrodes are then classified in accordance with British Standard methods, and the book thus proceeds to its fundamental purpose, which is to guide designers on the actual methods which can be adopted and the considerations that govern them. To the foundryman many of these principles will appear strange.

A very excellent analysis of butt welds, embodying the latest ideas and practice when dealing with plates, pipes and other forms of structure, are given in the chapter on types of welded joints, and under the headings "Design of Welds" and "Typical Assemblies." A large number of problems that arise daily in a drawing office are illustrated and calculated, and the book concludes with a chapter on factors that influence welding costs, a subject on which very varying conclusions can easily be arrived at.

The book is a handbook and the language is therefore condensed and didactic. The printing, layout and paper are in general clear and easily read. 104 pages out of 298, however, are devoted to tables of dimensions and properties of rolled sections, and while this is convenient information to have handy, it seems an unduly large proportion of a book which costs 45s. As new techniques and methods are developing every day, a handbook of this nature is bound to become out-dated after a time, but in the meanwhile it is a most valuable and comprehensive collection and classification of the data now available to the industry.

S. W. H.

Applied Metallurgy for Engineers, by Malcolm S. Burton. Published by the McGraw Hill Publishing Company, Limited, 95, Farringdon Street, London, E.C.4; price £2 16s. 6d.

The author has covered a broad field of metallurgical science in this book which is addressed to those studying metallurgy as a non-major subject. An effort has therefore been made to blend theory and practice, although it will be realized that in a text of 397 pages no more than a superficial treatment of many topics is possible.

In the first part, covering some 66 pages, the structure of metals, microscopy, pyrometry, mechanical testing and a study of phase equilibria are covered; some of the topics (*e.g.*, X-ray diffraction, pyrometry) only receive very slight attention and it is a little difficult to see how those encountering them for the first time can be expected to appreciate the significance of all the points involved.

The extraction of iron and steel; manufacture, including ingot production, and ingot defects, are briefly discussed in some 15 pages. Heat-treatment principles and techniques and the surface hardening of steels are dealt with in the next section which covers 46 pages. Foundry metallurgy, casting processes, moulding materials and foundry technology jointly occupy just less than one quarter of the book, and the author gives a useful introduction to these topics which are of such importance to the engineer.

A useful outline is also given of the theory and practice of the deformation of metals and alloys within the compass of 72 pages. The bonding of metals comprising welding metallurgy and processes, brazing and soldering are well described and this section is followed by a short chapter dealing with gas- and arc-cutting, and finally there is a chapter on powder metallurgy.

All the chapters are followed by groups of questions which are particularly suitable for private students, whilst for those wishing to pursue topics in more detail selected literature references are quoted. This work is well printed, illustrated, and indexed, and can be recommended to those wishing to obtain a general and overall picture of metallurgical science as far as it concerns engineers.

J. E. G.

Publication Received

Trade in Natural Rubber, by F. R. Horridge. Published by the Purchasing Officers' Association, Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4; price 3s. post free.

Many years' experience in the Singapore rubber market, followed by 20 years in the London market, have enabled Mr. Horridge to compile a booklet which is of exceptional interest to all who are concerned with natural rubber, in that it covers, fully—yet with economy of words—all stages in the industry from plantation to user, and is the only work of its type which gives a clear and complete account of the rubber market and its operations. Commencing with a description of planting methods and plantation administration, the booklet then deals with crop-collection, grading, packing, and shipment. The latter half of the booklet is devoted to an admirably comprehensive yet concise account of markets, their brokers and dealers, transaction terms and qualities. In addition there is a section on market tendencies, features and factors, speculative buying, and parity, with final comments on the developments and the market effects of synthetic rubber.

New Catalogues

Silicone Paints. In publication L2-1, Midland Silicones, Limited, 19, Upper Brook Street, London, W.1, stress the heat-, oxidation- and chemical-resisting properties of this class of paint. The leaflet is available to readers who write to Brook Street.

Fans for Mechanical Draught. In publication No. 3502, the Sturtevant Engineering Company, Limited, Southern House, Cannon Street, London, E.C.4, cover a wide range of fans for providing draught. The various types are illustrated and for each the essential technical data are given. Wisely, in this 24-page well-produced brochure, there has been included an enquiry questionnaire. Those interested should write to Southern House for a copy of the catalogue.

Magnesium Fabrication Facilities. Magnesium Elektron, Limited, 21, St. James's Square, London, S.W.1, have submitted an attractive booklet which tells just what can be done with magnesium by way of forging, extruding, spinning, riveting, welding, and anodizing. Presuming the objective of the publication is to implant the notion that magnesium has already taken its place as important material to engineers, this has indeed been well accomplished. The booklet is available to readers on request to St. James's Square.

Melting Furnaces. Stein & Atkinson, Limited, Parnell House, 25, Wilton Road, Westminster, London, S.W.1, have issued an interesting 14-page catalogue covering mainly oil-fired-rotary furnaces for both ferrous and non-ferrous metals. Instrumentation for the operation of these oil-fired furnaces is a model which could be emulated to advantage by operators of solid-fuel-fired furnaces. A very wide range of plant, with capacities varying from ½ to 15 tons, is available. Beyond this range, the provision of crane power for lifting the bodies for transportation becomes quite a problem. This well-produced brochure is available to readers addressing applications to Parnell House.

Casting Alloys. Sterling Metals, Limited, Northey Road, Coventry, have recently issued a well-produced data brochure covering aluminium, and three types of magnesium alloys, plus a page devoted to cast iron. Each of the light-alloy sections is divided, using concise tabular matter, into characteristics and uses; mechanical and physical properties; heat-treatment; and composition. Much space is allotted to the magnesium alloys, and details are given of the straight, and those alloyed with zirconium and zirconium and thorium. The introduction is not only well written, but contains much horse sense especially as to how the customer can help to ensure the receipt of better castings. The book is carried in striking stiff-cardboard covers and spirally bound. Copies are available to readers applying to Northey Road.

Sand Mixers. Boniface Frères S.A., Rue Barbet, Deville-les-Rouen, France, have prepared—in French—a well-illustrated brochure covering the range of Fordath mixers. Though originally designed for foundry use, these mixers are now being utilized in many other industries. Set out with the usual Latin logic, the booklet, after an introduction, deals with the mixers for foundry use and then for chemicals. The remaining sections cover basic principles; range of sizes; details of construction, and installation (here and there appears a word new to the reviewer *implantation*; is it a misprint?); maintenance; finally, spare parts and service after sales are dealt with. The brochure is available to French-speaking readers, on writing either to Deville-les-Rouen, or to the Fordath Engineering Company, Limited, at Albion Road, West Bromwich.

Electrical-engineers Exhibition

The sixth electrical-engineers exhibition to be held at Earls Court, London, from April 9 to 13, will be opened at 12 noon on Tuesday, April 9, by Lord Hailsham, Minister of Education; it is particularly appropriate that this Minister should open the exhibition as there is a 7,000 sq. ft. exhibit devoted entirely to the subject of education in the electrical industry. The exhibition will be open between the hours of 10 a.m. and 7 p.m. Particulars of exhibits having some interest for founders are given below:

ARTHUR LYON & COMPANY (ENGINEERS), LIMITED, will exhibit the latest addition to their range of products; "The Newphase Alternator" (stand No. L4).

NEWMAN INDUSTRIES, LIMITED will display a comprehensive range of their motors, from ½ to 600 h.p., including some of the new drip-proof type. In addition the company will show the new totally enclosed "JC" motor.

CENTRAL ELECTRICITY AUTHORITY will be exhibiting three models of atomic-power stations which are to be built in Scotland, Essex and Gloucestershire; the Authority's display will be contained within the Educational stand.

HEENAN & FROUDE, LIMITED, on stand No. Q24, will show their "Heenatone programme-control unit" designed for a repeated cycle of operations which, when set, can be carried on indefinitely; the unit can control any number of operations, planned in any desired sequence.

PHILIPS ELECTRICAL, LIMITED (stand No. F10), are exhibiting a range of a.c. voltage stabilizers with outputs from 300 to 6,000 va; the continuous-trunking fluorescent-lighting system and the new 80 w. fluorescent reflector lamp which is of special interest with regard to dust problems.

COPPER DEVELOPMENT ASSOCIATION will be exhibiting examples of products manufactured from cadmium/copper; chromium/copper; silver/copper and tellurium/copper. Each of these alloys has its own combination of special properties with wide applications in the electrical and electronic fields.

THE FIVE COMPANIES of the Lancashire Dynamo Group which will be exhibiting on stand No. E.9 are, Lancashire Dynamo & Crypto, Limited, with a comprehensive range of products including: a Class H insulated-motor, operating under high ambient-temperatures; equipment for school laboratory use; a fluid-coupling drive incorporating brake and gearbox and alternators, geared units and fractional horse-power motors. Foster Transformers, Limited, who will show equipment representing the extensive range of distribution transformers and the core and coil assembly of a 500 kva transformer. Testing equipment will be represented by a large primary-current injection-testing set. Lancashire Dynamo Nevelin, Limited's, rectifier division will display a demonstration mercury-arc rectifier-set as supplied to colleges, for tuitional purposes; the switchgear division will exhibit a "Unifront" load-distribution centre, a specially designed cubicle-switchboard incorporating dust-tight distribution switches. Crypton Equipment, Limited, are exhibiting equipment from their range of selenium metal-rectifiers covering electrically-propelled vehicle battery-charging, emergency lighting and special laboratory equipment for schools and Lancashire Dynamo Electronic Products, Limited, will show examples from a wide range of industrial electronic-control equipment including the new fractional-horsepower adjustable-speed drives. Of interest to founders will be the smoke alarm for use in chimney systems.

Company News

WALLSEND SLIPWAY & ENGINEERING COMPANY, LIMITED—The dividend is maintained at 50 per cent. with a final of 43 per cent. Last year's final of 13 per cent. was accompanied by a bonus of 30 per cent.

ENFIELD CABLES, LIMITED—Fluctuations in 1956 metal prices caused a loss of £85,000 and the group surplus was down to £103,051 (£205,663). Taxation takes £28,636 (£69,248), leaving a net loss of £16,531 (profit £79,012). No dividend is recommended on the £1,400,000 ordinary capital (as before).

SWAN, HUNTER, & WIGHAM RICHARDSON, LIMITED, shipbuilders and engineers, of Wallsend (Northumberland)—The ordinary dividend is being maintained at 14 per cent. by an unchanged final of 11 per cent. Having fallen by £145,915 to £2,579,666 in 1955, group profits rose in 1956 by £819,194, to £3,398,860.

AUSTRALIAN IRON & STEEL, LIMITED—After sharply increased provisions, net profit increased by £A888,858, or 40 per cent., to a record of £A3,116,000 for the year to Noveniber 30. The ordinary dividend, payable to the parent company, Broken Hill Proprietary Company, Limited, is raised from 6 per cent. to 10 per cent.

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—The interim dividend has been halved to 10 per cent., the directors bearing in mind the difficult trading conditions during the first six months of the financial year. The final may exceed the interim. A 20 per cent. final made a 40 per cent. total for the year ended June 30.

THOMPSON BROS. (BILSTON), LIMITED, general engineers—The company announces that in view of trading results to date and uncertain conditions in the industry, no interim dividend will be declared during the current year. A 2½ per cent. interim and 5 per cent. final were paid on the £477,896 ordinary for the year to July 31, 1956.

EFCO, LIMITED, electric furnace manufacturers, of London, S.W.1—An offer of 208,668 10s. ordinary shares at 10s. per share in the proportion of two new 10s. ordinary for every three £1 ordinary held on March 21, is to be made. Further capital was created and the existing £1 ordinary split to 10s. at an extraordinary meeting on March 22.

BRITISH WAGON COMPANY, LIMITED—Despite a reduction in business owing to hire purchase controls, a record profit was made in 1956. Earnings may be spread over two years so that, although 1957 has opened favourably, the effect will not be felt until 1958. Group net earnings were £922,343 (£791,343). The 20 per cent. dividend is repeated.

CHARLES CLIFFORD, LIMITED, non-ferrous metal manufacturers, of Birmingham—A short order-book position compared with a year ago makes the maintenance of economic production difficult and tends to increase costs. Meanwhile competition has become even more severe. Group net profit dropped to £65,291 (£146,522), but the dividend is 10 per cent. (same equivalent).

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED—It is proposed to capitalize £2,666,034 of share premium account to provide for a one-for-one scrip issue to ordinary holders of April 1, the new shares to rank for full dividend declared for the year which began on September 30 last. The directors also propose to offer by way of right 1,777,356 ordinary £1 shares on a two-for-three basis, also to holders of April 1.

GEORGE COHEN 600 GROUP, LIMITED—Provisional allotment letters and excess share application forms were posted on March 26 for the rights issue to which reference was made in our issue of March 14. The issue is of 2,500,000 5s. ordinary shares at 8s. 6d. each on a one-for-four basis to holders of March 15. The company is also issuing 1,000,000 6½ per cent. second cumulative preference shares for placing at 20s. 6d. An extra-ordinary meeting was held on March 26 to create capital and to effect alterations in the articles, including an increase in borrowing powers.

A.B.C. COUPLER & ENGINEERING COMPANY, LIMITED—New developments will continue to absorb a considerable proportion of current and past earnings. A "very high" proportion of current assets is held oversea and profits earned in India cannot be returned in dividends without "suffering confiscatory rates of taxation." Nearly all the group's traditional railway equipment goes overseas, mainly to Commonwealth countries. Group output for the year to September 30, 1956, was a record both in volume and value, but with price competition abroad and cost inflation at home, profits declined to £106,078 (£129,765).

BIRFIELD, LIMITED, manufacturing engineers, etc., of London, W.1—Following on the issue of £2,000,000 6 per cent. unsecured stock to finance expansion, it is now proposed, subject to CIC consent, to issue a further £1,500,000 unsecured stock to repay bank borrowings and finance further expansion. Profit margins have fallen because much of rising costs has not been passed to customers, but the group is now compelled to raise prices. Demand from railway and aircraft industries continues to exceed capacity. Group sales were £16,290,000 (£15,100,000) and the period net profit is £606,755 (£924,076 for the year). The dividend is 15 per cent. against 13½ per cent. equivalent.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lavon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

THORNE, April 7—Supplying and laying of iron watermains. Deposit £1 1s. Surveyor, Council Offices, Thorne, Yorkshire.

BELFAST, April 15—Cast-iron pipes and fittings and iron castings for the year commencing July 1, 1957. Documents from the Gasworks, Ormeau Road, Belfast.

NEWCASTLE UPON TYNE, April 15—Portable electric cargo-crane. Deposit £2 2s. R. N. Eggleton, Bewick Street, Newcastle upon Tyne, 1.

PAKISTAN, April 9—Industrial Machinery for the ICA procurement for Pakistan. (ESB/7787/57/ICA.)

INDIA—Road-making machinery for the Bangalor Corporation, will call for cast-iron pipes (ESB/7391/57.)

SOUTH AFRICA, April 12—Cast-iron chairs for the Stores Department of the South African Railways. (ESB/6551/57.)

SOUTH AFRICA, April 12—Vehicle-testing equipment for the Tender Board for the Union of South Africa. (ESB/7714/57.)

AUSTRALIA, April 25—Cast-steel passenger-car type bogies for the Western Australia Government Tender Board. (ESB/7261/57.)

SOUTH AFRICA, April 18—Hand and pneumatic chisels for the Stores Department of the South African Railways. (ESB/7564/57.)

RHODESIA, April 18—Metalworking machinery for the Federation of Rhodesia and Nyasaland. (ESB/7497/57.)

PAKISTAN, April 15—Machine tools for ICA procurement for Pakistan for the Department of Supply and Development. (ESB/7476/57/ICA.)

IRISH REPUBLIC, April 10—Mechanical and pumping equipment. (ESB/7511/57.)

PAKISTAN, April 16—Pig-iron for the Department of Supply and Development. (ESB/7228/57.)

RHODESIA, April 18—Woodworking machinery for the Federation of Rhodesia and Nyasaland. (ESB/7498/57.)

SPAIN—Machinery and equipment for the manufacture of aluminium products. (ESB/5141/57.)

FORMOSA, April 15—Machinery for plastic manufacture and working for the Central Trust of China. (ESB/7369/57/ICA.)

News in Brief

THE INSTITUTION OF CHEMICAL ENGINEERS announce that the meeting arranged for Tuesday, April 16, at the Geological Society has been cancelled.

THE BRITISH INSTITUTE OF MANAGEMENT announce that the 6th Scottish Conference on management will be held at Gleneagles from May 3 to 5.

M. HENDERSON CLARK, LIMITED, Victoria Yard, Thornaby-on-Tees, Yorks, is planning to extend the foundry at The Docks, Middlesbrough.

THE FOURTH ANNUAL SYMPOSIUM of high-vacuum technology will be held in Boston, Massachusetts, on October 9, 10, and 11, at the Hotel Somerset.

IT WAS REPORTED from Washington on March 26 that the US ban on the export of heavy melting scrap had been lifted. No licences have been issued since February 27.

Mr. ROBERT CARR, Parliamentary Secretary to the Ministry of Labour and National Service recently opened new baths for foundry workers, at the Butterley Company Limited, Ripley.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, announce that on and after April 7, the telephone number of the Scottish office of the company at 147, Bath Street, Glasgow, C.2, will be CITY 4878.

A £10,000 SHOWER-BATH BLOCK, adjacent to the new moulding shop, at the Park Foundry (Belper) Limited, was recently opened by Mr. W. A. Ballard, director and general manager of the company.

SURATEL PRODUCTS, LIMITED, announce that the name of the company has been changed to Surecast Foundries Limited, the address (800 to 801 Oxford Avenue, Slough, Bucks) the management, policy and personnel remained unchanged.

A SYMPOSIUM on "Aluminium in Electrical Engineering" is to be held by the Aluminium Development Association at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, on Thursday and Friday, May 16 and 17.

THE SIMPLEX ELECTRIC COMPANY (S.A.) (PTY.) LIMITED, is to double its foundry capacity. The extension is being carried out by Paterson Hughes S.A. (Pty) Limited, and the latest developments in mechanized foundry practice will be incorporated.

THE BRITISH TRANSPORT COMMISSION is considering the closing of the Gorton Tank Foundry, Manchester as the reduction in demand for steam locomotives has resulted in a fall-off in the demand for iron castings. No final decision about the future of the plant has yet been taken.

TOTAL refined zinc production for OEEC producer countries (Austria, Belgium and the Belgian Congo, France, Germany, Italy, Netherlands, Norway, and the United Kingdom) amounted to 65,158 metric tons in February, as compared with 71,686 tons in the previous month.

PLANS for the new office building to be erected on the site of the Gaiety Theatre at the corner of the Strand and Aldwych, London, W.C.2, by the English Electric Company, Limited, having now been agreed with the London County Council, work on demolishing the theatre is expected to start shortly.

THE CONTRACT for the design and manufacture of the main propelling turbines and condensers for Britain's first nuclear powered submarine has been given to the English Electric Company, Limited, by the Admiralty. The order covers the prototype machinery, which will be tested in a land-based hull, and the turbines for the first seagoing version of the submarine.

THE UNITED STATES STEEL CORPORATION announces that it has enlarged the group of steel producers who are licensed to manufacture and sell its Cor-Ten steel —a corrosion-resistant, high-strength, low-alloy steel— by licensing the South African Iron and Steel Corporation (ISCOR) of Pretoria, and de Wendel & Cie., S.A. of Paris.

THE SOKE OF PETERBOROUGH County Council's Planning Committee has approved (subject to the approval of the Ministry of Housing and Local Government) a project for the erection of a new foundry for G. W. S. Burdett & Company, Limited, engineers, Eastgate, Peterborough, on a new industrial estate in the Newark area of Peterborough.

TEDDINGTON INDUSTRIAL EQUIPMENT, LIMITED, Sunbury on Thames have reduced the price of their OV Engine Watcher as a result of improved methods and increased production. Self-acting, the instrument automatically stops the engine if dangerous conditions are reached and it provides a continuous watch on lubricating oil pressure and coolant temperature.

THE SECOND INTERNATIONAL CONFERENCE on non-destructive testing, which is to be held in conjunction with the 17th annual convention of the Society for Non-destructive Testing, will take place at the Hotel Morrison, Chicago, Illinois, USA, on November 3 to 8. Details are available from the Society of Non-destructive Testing, 1109 Hinman Avenue, Evanston, Illinois.

TO MARK THE CONCLUSION of the West Midlands Clean Air Campaign, a two-day conference, organized by the Combustion Engineering Association and the Solid Smokless Fuels Federation, is to be held at the Queen's Hotel, Birmingham, on April 16 and 17. The theme of the conference will be the "Application of the Clean Air Act to Private Dwellings and Industry."

A COURSE ON INDUSTRIAL AND FACTORY LAW will be held under the auspices of the Industrial Welfare Society on May 28-30 at Robert Hyde House, 48 Bryanston Square, London, W.1. Mr. Harry Samuels, M.A., barrister-at-law, will be the lecturer. The course covers the legal groundwork necessary to industrial managers and executives. Particulars can be obtained from the secretary of the Society at the above address.

TO ENABLE adjustments and repairs to turbo-alternator sets at power stations to be carried out on the spot, the British Thomson-Houston Company, Limited, has put into operation two mobile workshops. Each unit consists of a 14-ton lorry carrying heating and hydraulic equipment, milling machines, surface grinders, and a machine for balancing completed rotors. A specially built lathe has been designed for transportation on a low loader for assembly on power-station floors.

FROM THE END OF JUNE, the Grantham factory of Ransome & Marles Bearing Company, Limited, will be closed down, and production will be concentrated at the two main factories at Newark (Notts) and Annfield Plain (Co. Durham). A number of employees will be offered work at Newark, the company states, and the actual closing will be arranged, as far as possible, in such a way as to give other employees ample time to find alternative employment. About 150 people are affected.

A COMPRESSOR SET, consisting of an 18-cylinder "Deltic" diesel engine and two Howden rotary positive-displacement two-stage compressors, for use with a mobile liquid-oxygen plant, has been ordered from

(*Continued on page* 430)

Have you seen THE AMAZING

"Knock-out"

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SUPINEX "R"

Illustration of Supinex "R" in use by courtesy of Messrs. John Needham & Sons Ltd., Stockport.

AN ENTIRELY NEW TYPE OF BINDER, STARTLING IN ITS PERFORMANCE . . . . FUMES AND GASES GREATLY REDUCED

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FACTORY: CONCORDIA WORKS, LONDON, E.14.

Free working samples gladly supplied on request.

News in Brief

(*Continued from page 428*)

D. Napier & Son, Limited, London, W.3, by the Engineer Research and Development Laboratories of the United States Army. The set, which is completely self-contained, and weighs nearly 20 tons, can be transported by road or by air. It will supply up to 30,000 lb. of dry air per hour at 100 lb. per sq. in.

A STAFFORDSHIRE-AREA BRANCH of the British Association for Commercial and Industrial Education was formed at a meeting in Wolverhampton on March 27, at which Mr. C. L. Old, principal of the Wolverhampton and Staffordshire College of Technology, was chairman. The speaker at the inaugural meeting was Mr. M. W. Ivens, communications manager of the Esso Petroleum Company, Limited. Mr. P. Hughes, personnel manager of H. M. Hobson, Limited, Wolverhampton, is secretary to the new group.

TEN THOUSAND workers had been restored to full-time from short-time working in the past month, Mr. J. W. Eldridge, Midland Regional Controller of the Ministry of Labour, reported after a meeting of the Regional Board for Industry, in Birmingham, on March 19. The total number of short-time workers in the region had fallen in the past four weeks from 33,000 to 23,000 he said. It was the most marked drop in the total for many years. In January when short-time working reached a peak, the figure in the region was 38,900.

MR. EDWARD PLAYER, of Birmid Industries, Limited, was the principal speaker at the annual dinner of the Birmingham Metallurgical Society (Inc.) on March 21. Mr. Player said that it was not so long ago that the attempts of metallurgists to transmute metals caused tolerant amusement; yet now they were doing it every day in atomic piles. The president of the Society, Mr. H. H. Symonds, presented the Society's medal, certificate, and 15 guineas, to Mr. J. M. Summerton of Birmingham University for an essay on "Theories of Metallic Creep."

THE HEADQUARTERS OFFICES of the British Institute of Management and the Institute of Industrial Administration, at present at 8 Hill Street, London, W.1., will be transferred this spring to specially planned premises at 80 Fetter Lane, London, E.C.4. The move, which is part of the scheme for re-organization of the two bodies into one Institute, will take place in the latter half of May. The Institute of Personnel Management, which is an entirely separate body and is at present occupying part of the premises in Hill Street, will also take offices in the new "Management House."

FOUNDRY SERVICES, LIMITED, has planned an intensive study of the South American foundry field. This important assignment has been given to Mr. E. N. Horley who rejoined the company, after completing his National Service, to train as an overseas technical representative. At the age of 25, he leaves this country on April 7 charged with the interesting mission of looking into conditions and opportunities for expansion in Mexico, Peru, Venezuela, Colombia, Cuba, Panama, and the West Indies, where he will have the support of the firm's agents already established in those countries.

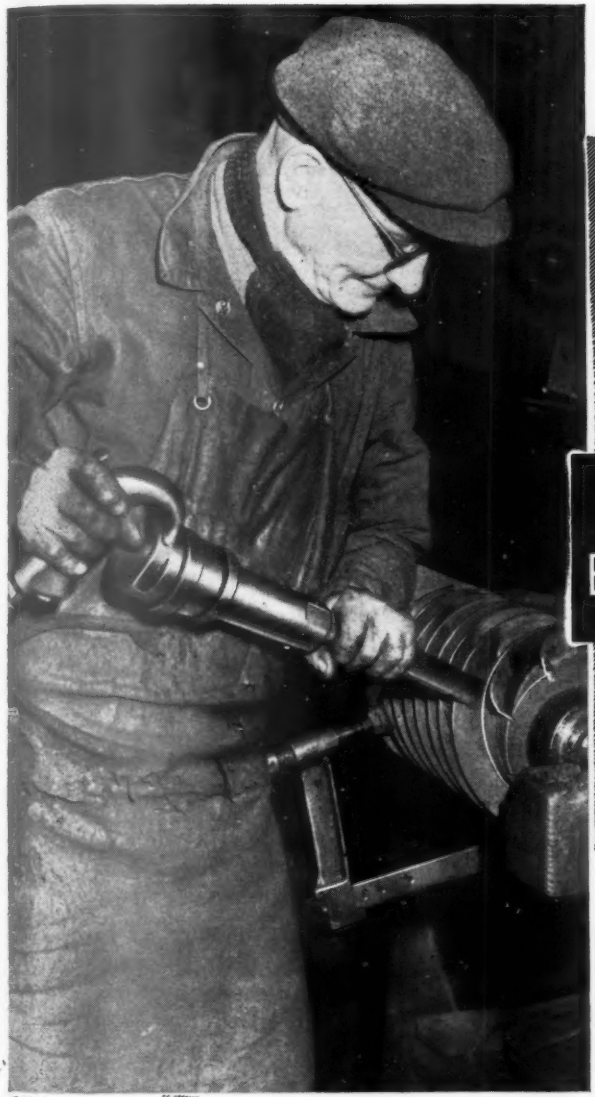
THE NEGOTIATIONS which began on October 1 last, between delegations of the United Kingdom and Japan on financial and trade questions of common concern to the two countries, have been concluded and new trade arrangements have been signed by the Rt. Hon. David Ormsby-Gore, M.P., Minister of State for Foreign Affairs, and H. E. the Japanese Ambassador. These arrangements cover the period of one year ending September 30, 1957, and provide for import facilities and related matters between Japan on the one hand and the United Kingdom and its dependent territories on the other hand.

A FOUNDRY built at a cost of well over £100,000 and "push-button" controlled in every respect began operation at Wolverhampton last month. The foundry is owned by John Hill & Sons (Ironfounders) Limited, a member of the Staveley group of companies. According to the managing director, Mr. G. Scales, it is the first foundry in this country to be equipped with electronic devices to control the flow of sand from the hoppers. Of the foundry's production 70 per cent. will be for the US, mainly castings for tobacco and printing machinery, and it is hoped to get four times the output with the labour force at present employed.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, Birmingham, have ordered through Fleischmann (London) Limited, 16, Northumberland Avenue, London, W.C.2, who are acting as UK distributors for the makers, arc-melting plant for an annual production of about 2,000 tons of double-melted titanium ingots. The plant, claimed to be on the largest in the world will be equipped with fully-automatic, electronically-controlled electrode feeder-gear and will be laid out for remote control. It was developed by W. C. Heraeus G.m.b.H. of Hanau, Western Germany, in collaboration with ICI and is at present under construction at Hanau.

THE BRITISH EMBASSY at Madrid have reported that it was announced in the *Official Gazette* of February 24, that the firm of Aluminio Espanol, S.A., Villanueva 14, Madrid, have been authorized to extend their factory for the manufacture of aluminium-sheet, bars, aluminium alloys and refined aluminium at Huesca. The new installations are to be in operation within two years. Imported machinery and raw materials will be required but specifications and quantities are not stated. United Kingdom firms specializing in this type of equipment who are interested in the project are advised to keep in close touch with their local agents. (Reference ESB/6680/57 to the Export Services Branch, Lacon House, Theobalds Road, London, W.C.1.).

THE BOARD OF TRADE announce the following changes in their regional organization to operate from about next June:—Closing of the North Midland regional office at Nottingham and transfer of work to the Birmingham office (Midland region) except that for Lincolnshire, which will be transferred to the Leeds office (East and West Ridings region); closing of the Eastern regional office at Cambridge and transfer of work to London; closing of the Southern regional office at Reading and transfer of work to London except that of Dorset (excluding Poole), which will be transferred to the Bristol office (South Western region); and closing of all district offices, except Inverness, and transfer of work to the appropriate regional offices. A new regional office will be set up in London to deal with the work of the present Eastern region plus that for Oxfordshire, Buckingham and Berkshire which is at present being carried out at Reading. This new office will be located as a separate unit in the same building as the present London and South Eastern regional office. The latter office will take over Hampshire and Poole (Dorset), which are at present being administered by the Reading office.



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This is the BOYER SUPERIOR CHIPPER

JUST THE RIGHT TOOL FOR THIS PARTICULAR JOB

Boyer Superior Chippers start smoothly, handle easily, have extremely fine throttling control to impart the correct hitting speed and power, and are unfailingly reliable. For these operational features and the comprehensiveness of the range, these chippers and allied C.P. equipment are the most suited-to-the-job tools for chipping, caulking, scaling, scraping and stone work. Write for the chippers and scalers section of catalogue No. 50.

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Personal

Mr. DAVID ROBERTSON has been appointed managing director of Ferrous Castings, Limited, Warrington.

Mr. GEORGES DELBART has been nominated vice-president of the *Association Technique de Fonderie*.

Mr. W. H. BAZLEY has been appointed a director of Willey & Company, Limited, and the Vulcan Stove Company, Limited.

Mr. R. L. BROWNHILL has been elected president of the Dudley Chamber of Commerce in succession to Mr. Gordon Michie.

Mr. G. C. H. MATTHEY has been elected chairman of Johnson Matthey & Company, Limited, following the recent death of Mr. W. H. P. Matthey.

Mr. FRANK PERKINS, founder and chairman of F. Perkins, Limited, diesel-engine manufacturers, of Peterborough, has been selected as High Sheriff of Cambridgeshire and Huntingdonshire.

Mr. HARRY HORROCKS, managing director of S. Booth Horrocks & Sons, Limited, heating engineers of Northampton, has been elected president of Kettering Chamber of Trade and Commerce for 1958.

Mr. WALTER WEHTJE, managing director of the Atlas Copco group, is to retire on April 13. His successor is Mr. KURT ALLAN BELFRAGE who was appointed deputy managing director of the world group in 1955.

Mr. KENNETH N. DAVIS, a director of Radiation, Limited, has agreed to become chairman of the Council of Ironfoundry Association's training and education committee, in succession to Sir Harold West.

Mr. M. S. SPICKERNELL, sales superintendent, David Brown Foundries Company, Penistone, since 1954, has become sales superintendent, foundry division, K. & L. Steelfounders & Engineers, Limited, Letchworth.

General SIR WILLIAM MORGAN has resigned from the boards of Associated Electrical Industries, Limited, Siemens-Ediswan, Limited, Siemens Brothers & Company, Limited, and the Edison Swan Electric Company, Limited.

Mr. HAROLD GIBSON, manager of the Sheffield sales office of Brook Motors, Limited, for 26 years, retired at the end of March. Mr. BRAILSFORD SYKES, formerly technical sales engineer at Sheffield, takes over as manager.

Mr. ERIC O. RUSTON, a director of F. T. Ruston & Sons, Limited, agricultural engineers, of St. Ives (Hunts), and other companies, has accepted the invitation of the St. Ives Town Council to take office as mayor for the coming year.

Mr. WALTER SEEBACH, a past-president of the International Committee of Foundry Technical Associations, has been presented, by his colleagues at the Superior Foundry Inc., Cleveland, Ohio, with a plaque commemorating his ten years of presidency of this company.

Metal Industries, Limited, announce that the Rt. Hon. LORD COLYTON, P.C., C.M.G., has been appointed a director of the company. It is also announced that, owing to increased demands on his time, Mr. J. T. RYMER has decided to resign from the board with effect from March 31.

Mr. CHARLES J. H. STEVENS, F.R.S.A., manager of the cable accessories department of Johnson & Phillips Limited, Charlton, London, S.E.7, on his retirement on March 29, after 44 years with the company, was presented with a cheque by the directors in appreciation of his long and valuable service.

Viscount SIMON, president of the UK Chamber of Shipping, has been elected joint vice-chairman of the General Council of British Shipping. Lord Simon is associated with a large number of shipping companies and he is a director of Silley, Cox & Company, Limited, engineers, brass and iron founders, etc., of Falmouth, and the Falmouth Docks & Engineering Company.

Mr. REGINALD CATHERALL has been appointed a director of Solartron Research and Development, Limited, Goodwyn's Place, Dorking, Surrey. He is at present in the United States on a two months' visit to the Consolidated Electrodynamic Corporation, Pasadena, California, for whom the Solartron Electronic group act as sole selling agents in the United Kingdom.

Mr. L. C. HARMAN, divisional administration executive of Smiths Aircraft Instruments, Limited, has recently been appointed to the board of Waymouth Gauges & Instruments, Limited, one of the Smiths group of aviation companies. Mr. Harman, who joined the accounts department of Smiths shortly after leaving school in 1924, now becomes financial director to Waymouth Gauges.

Among recipients of long-service awards at a ceremony in the canteen of the Wednesfield division of the Yale and Towne Manufacturing Company, on April 6, will be Mr. H. GILBERT RAMSELL, general manager, who is to present the awards. With a record of 37 years' association with the company he qualifies for one of the gold watches to be given to employees with more than 25 years' service. Special gifts will go to two employees who have completed more than 50 years' service.

Obituary

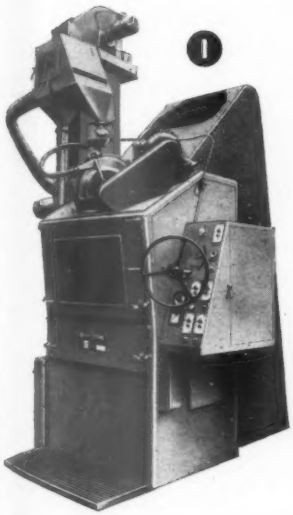
Mr. FRANK LEWIN, manager of patents for the David Brown Corporation, Huddersfield, died on March 27 at the age of 77. For nearly 50 years he had conducted a patent agency in Halifax and Huddersfield under the name of Baron & Lewin.

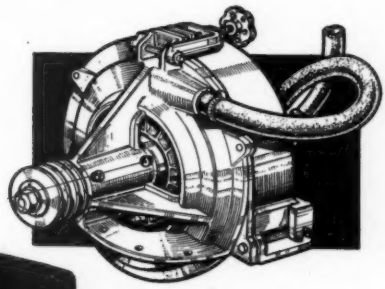
Mr. EDWARD FITZWALTER WRIGHT, the chairman and managing director of the Butterley Company, Limited, Ripley, Derbyshire, died on Wednesday, March 27, at the age of 54. He was a direct descendant of John Wright, one of the three partners who founded the company in 1790, becoming a director in 1930, managing director in 1938 and chairman and managing director in 1944. He became High Sheriff of Derbyshire in 1942, and was president of the Mining Association until it was disbanded after nationalization.

The death occurred last week of Mr. ROBERT STEWART, M.B.E., managing director of Lankester & Son, Limited, Holyrood Place, Southampton. Mr. Stewart was born in Dumbarton, where he was educated at Dumbarton Academy, and he served his apprenticeship in the same town at the firm of Archibald McMillan & Son. Later he was with John Brown & Company, Limited, at Clydebank. In 1927, he joined Samuel White & Company, Limited, of Cowes, where he rose to be shipbuilding manager. In 1938, he became general manager of Philip & Son, Limited, where following an air raid he was awarded the M.B.E. for leadership, courage and devotion to duty. He was a member of the Institution of Naval Architects and a director of the Southampton Chamber of Commerce. He was 60 years old and very prominent in the public life of Southampton.

Shot Blast Equipment

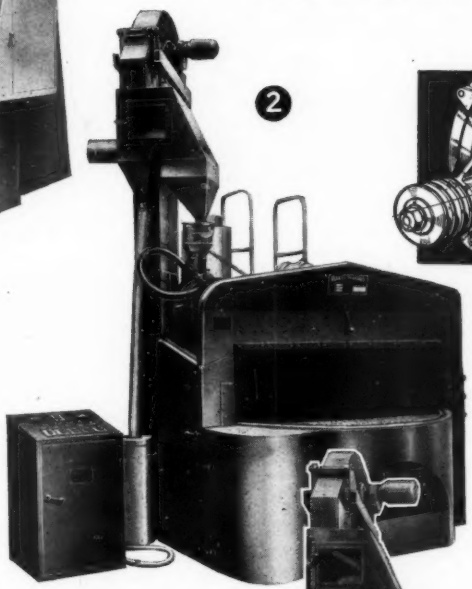
This A-S-L Turbine is the most modern Shot Blasting Unit available. The bi-phase air injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.

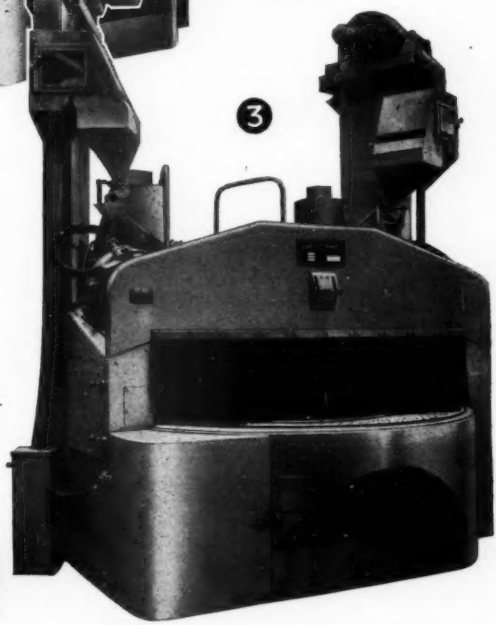




Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

These machines do not require pits or special foundations.





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2 **CADET**

3 **MEDIUM**

Our standard range of Rotating Barrel and Table Shot Blast Machines is capable of handling a wide range of Foundry products. Both types are semi-automatic, the rotating barrels being equipped with skip hoist loading gear and frontal discharge mechanism. These modern highly efficient machines are in use in Foundries all over the world, and are built to the high standards of design, materials and workmanship characteristic of all Baker Perkins' machines.

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ENGINEERS
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Raw Material Markets

Iron and Steel

About 100 furnaces now in blast are giving maximum outputs of pig-iron and current production is higher than in any previous period. With new furnaces being blown in from time to time and increased tonnages obtained from reconstructed furnaces, outputs steadily increase, and it is fully expected that the 14,000,000 tons aimed for this year will be obtained. The primary and only need for this expansion at present is to provide extra supplies of basic pig-iron for the steelworks to satisfy their increasing ingot production. The reduction in imports of scrap for February (which, at about 37,500 tons, is less than half of the monthly average for last year), indicates the extent to which the steelworks are dependent on adequate supplies of pig-iron. But, as home production increases, the need for imported supplies will decrease correspondingly.

Although consignments of imported iron ore in February were on a lower scale, the furnaces have adequate supplies available, but with increasing outputs of pig-iron the necessity for larger tonnages of both ore and blast-furnace coke is essential. Current outputs of pig-iron in all the foundry grades are sufficient to fulfil the needs of the trade, and, while a fairly high proportion of available tonnages are being taken up, there is no heavy pressure for supplies from any section.

The improved trading conditions in the motor vehicle industry are bringing increased requirements for castings, and this in turn will be reflected in larger demands from some of the engineering foundries for low-phosphorus pig-iron and hematite. The foundries catering for the general engineering trade as well as the speciality and machine-tool trades are also taking up fairly good tonnages. Present supplies are sufficient, but there is not a wide margin between supply and demand. Refined irons are in good supply and makers are able to accept more business.

Only moderate trade continues at most of the light foundries and demands for light castings are readily completed with no opportunity to add to forward bookings. Jobbing foundries are fairly well off for work, but the textile foundries have capacity available. Some of the engineering foundries which use the high-phosphorus pig-iron are accepting a fair amount, but overall production of this grade of pig-iron still exceeds demand. Some producers have stocks which could be disposed of overseas at remunerative prices, but shipments depend on their ability to secure export licences.

Heavy machinery cast-iron scrap is in good demand, but the call for light and medium grades is moderate. Foundry coke is available in adequate quantities and regular and sufficient tonnages are being delivered to the foundries. Ganister, limestone, and firebricks are in good supply.

The re-rollers continue to obtain good outputs of small bars, light sections, etc., although their order-books, particularly for small bars, are not so heavy as they were a short time back. More export business, if licences could be obtained, would be both helpful in filling their capacity for small bars and also remunerative. Some consignments, although small, of steel semis continue to come to hand from abroad, but reliance is placed almost wholly on home steelworks for supplies of billets, etc., and deliveries from them are maintained at a good level. In some areas, including the English Midlands, there is continued pressure for increased tonnages.

Non-ferrous Metals

Firm prices were recorded all round yesterday (Wednesday) on the London Metal Exchange on the news of the non-continuance of the shipbuilding and engineering strikes.

Suddenly, a number of bullish influences have appeared from different parts of the world to push up the copper price well above £240 a ton. Strike threats have been reported from Canada, where Noranda may possibly have to close, and from Chile, where the miners at El Teniente are prepared to strike if negotiations over their new contract to replace the one expired on March 31 are not to their liking.

From New York, the chairman of Anaconda has declared that American fabricators had drawn on their stocks by as much as 25 per cent. over the last four months. More important, he asserted that 13.9 per cent. of the 1956 production cost over 30 cents a pound, 22.6 per cent. cost over 29 cents, and 33.1 per cent. cost over 25 cents a pound. These figures were used to point out that the present price level of 32 cents a pound was not satisfactory from the producer's point of view. The obvious corollary to these remarks is that the US primary producers will do all they can to maintain the present price as a floor level and to raise it as soon as possible. Finally, Sir Ernest Oppenheimer, at the official opening of the new Bancroft copper mine, said that he believed the present price situation was only temporary. These factors outweighed the fact of poor demand and growing supplies in London. In America, demand is no better, and while custom smelters are still quoting 32 cents, business has been conducted down as low as 30½ cents per pound.

The sharp rise in the price of tin in London after the floor price under the international tin agreement had been raised £90 a ton has not been held and the quotation has drifted back to near its former level. Demand is only fair on both sides of the Atlantic. In New York the quotation has again receded to below $1.00 a pound. From next Monday UK prices of tinplate are to be reduced as a result of the fall in the price of tin, which is taken into account quarterly in adjusting tinplate prices. From Monday cold-reduced plates and hand-mill plates will cost 2d. less per basis box. In the US on the other hand, can prices are to be raised on May 1 to offset the higher prices for tinplate, labour, freight, materials, and other costs. Early last month US steel producers raised the tinplate price by 4½ per cent.

Lead has been an idle market in London owing to the labour situation, but there has been no rush to sell metal, which is materially aiding to keep the price steady. In the US demand is steady with the purchase of replacement batteries still ahead of the corresponding period last year. The quotation is steady at 16 cents a pound.

Zinc is also a featureless market in London. In New York demand is quietly steady with renewed interest in "Prime Western" at 13½ cents a pound, East St. Louis, being displayed.

STANTON IRONWORKS COMPANY, LIMITED, near Nottingham, has secured an order from the Government of Venezuela for spun-iron pipes to a value of approximately $1,000,000. The pipes ranging in diameter from 80 m/m to 750 m/m are concrete lined and fitted with screwed-gland and bolted-gland flexible joints. The material will be used for extensions to the Caracas water system.

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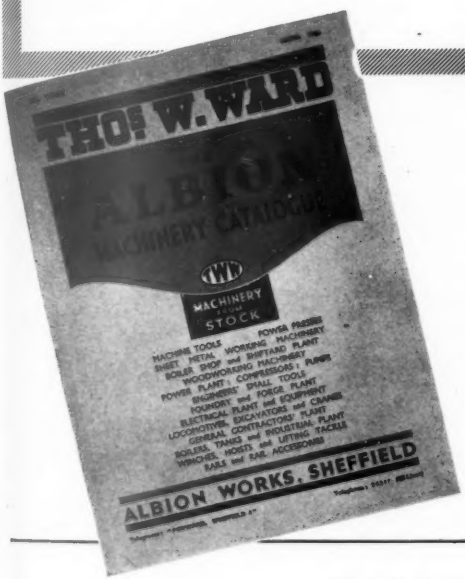

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Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

April 3, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £53 5s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 12s. 4d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 4d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £96 0s.0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3½d. to 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3¾d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent. Nb + Ta, 22s. 0d. to 23s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £82 12s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d.; silico-manganese, £41 7s. 6d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in. untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £65 10s. 3d.; nickel-chrome, £92 13s. 0d.; nickel-chrome-molybdenum, £104 11s. 6d.

NON-FERROUS METALS

Copper.—Cash, £245 15s. 0d. to £246 0s. 0d.; three months, £246 5s. 0d. to £246 10s. 0d.; settlement, £246 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 271s. 6d. per cwt. basis; 20 s.w.g., 304s. 9d. per cwt.

Tin.—Cash, £776 0s. 0d. to £777 0s. 0d.; three months, £766 10s. 0d. to £767 0s. 0d.; settlement, £777 0s. 0d.

Lead (Refined Pig).—First half April, £112 15s. 0d. to £113 0s. 0d.; first half July, £112 5s. 0d. to £112 10s. 0d.

Zinc.—First half April, £98 15s. 0d. to £99 0s. 0d.; first half July, £95 10s. 0d. to £95 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £129 5s. 0d.; rolled zinc (boiler plates), all English destinations, £127 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £105.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; rods, drawn, 2s. 11d.; sheets to 10 w.g., 206s. 6d. per cwt.; wire, 2s. 8½d.; rolled metal, 206s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £178; B6 (85/15), £218; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £228; HTB2 (38 tons), £240; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £237; LG3 (86/7/5/2), £248; G1 (88/10/2/½), £297; (88/10/2/1), £285.

Phosphor Bronze.—BS1400, PB1 (AID released), £309 per ton.

Phosphor Bronze Strip, etc.—Strip, 290s. 0d. per cwt.; sheets to 10 w.g., 290s. 0d. per cwt.; wire, 3s. 11½d. per lb.; rods, 3s. 3½d.; tubes, 3s. 4½d.; chill cast bars: solids 3s. 4d., cored 3s. 5d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 2¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 1¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £86 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £258; AB2, — . Solder, brazing, BS1945, type 8 (50/50), — per lb., type 9 (54/46), — per lb.